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TRANSACTIONS

OF THE

ABERDEEN PHILOSOPHICAL SOCIETY

VOL. I.

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TRANSACTIONS

OF THE

ABERDEEN PHILOSOPHICAL SOCIETY

VOL. I.

INCLUDING RESUMÉ OF THE WORK OF THE SOCIETY FROM 1840 TO 1884.

ABERDEEN:

PRINTED FOR THE SOCIETY.

1884.

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NOTE.

The Papers in this Volume have been revised by their respective authors.

The Volume has been compiled and edited by the Secretary.

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ABERDEEN PHILOSOPHICAL SOCIETY.

AT a Meeting of the Society, held on the 8th April, 1884—Sheriff Dove Wilson, President, in the Chair—it was resolved that the following Paper, "On the History and Public Work of the Society," read by the Secretary, Mr. Alex. D. Milne, should form the introduction to this First Volume of the Society's Transactions.

ON THE HISTORY AND PUBLIC WORK OF THE SOCIETY.

THE Volume of Transactions now completed has occupied longer time in preparation than was originally anticipated. The first resolution of the Society contemplated simply the printing of selected Papers, and their circulation, when the selection of Papers had reached the dimensions of a moderately-sized volume. Before that stage had been reached, the Society further resolved that, this being the first volume of its Transactions ever printed, it should include an account of the Society and of its proceedings from the commencement, in 1840. The Society at the same time embraced with pleasure the opportunity of also including in the first volume several Biographical Papers—mostly memoirs of early members of the Society—proposed to be read to the Society by Dr. Bain. These were completed and fully revised by Dr. Bain more than a year ago.

The present volume therefore contains :—

A List of the Titles of all the Papers read since the commencement of the Society in 1840, with the names of the members who communicated them.

A List of the Summer Excursions made by the Society, at

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several of which Papers bearing on the localities visited were read.

The Names, and the Designations at the period of their election, of all the members—ordinary, honorary, or corresponding—elected since the commencement.

A full Report of a Selection of Papers read since the end of 1872.

To the third of these lists are appended, within brackets, the positions now or since occupied by members, where these could be ascertained with accuracy, in spheres of life and work—literary, scientific, educational, &c.—cognate to the objects of the Society. It is hoped that the information here recorded will be interesting to many past and present members of the Society, and to their friends.

But the history of the Society, which now closes its forty-fifth session, is, in some important respects, interesting in particulars which cannot be gathered from the records above alluded to. During these years the Society, as a Society, and also through many of its leading office-bearers and members, took part in much interesting and important work in the literary and scientific world, and also in the discussion of national and local questions of interest to the public, besides lending its aid to various public undertakings in harmony with its objects. To have printed a full copy of the minutes and transactions from the commencement might doubtless have indicated most of this work, but it would also have involved the reproduction of much that is now of little consequence. The Council thought it better, therefore, that I should briefly present a *resumé* of the history and public work of the Society, as more likely to serve the purpose of a permanent record.

Origin of the Society.

In the volume will be found the record of the preliminary meeting held in Professor Gregory's house, Old Aberdeen, on 11th January, 1840. At that meeting the Society was originated, and at the next meeting it was formally constituted by the adoption of general rules, and the election of members and office-bearers. Reference to the list will show that the Society

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originated mainly amongst the professors and lecturers of the two Universities, which were then, and for twenty years thereafter continued to be, separate institutions.

Constitution and Objects of the Society.

In the preliminary minute referred to, the members denominated themselves "Cultivators of Natural Science." This seems to fall short of what is implied in the name, which was adopted at the same time—the Aberdeen Philosophical Society. But a glance at the Papers read during the first few years of the Society will show that the Society, from an early period, followed the name rather than the comparatively narrow definition referred to, and its papers have ever since been in harmony with the formula embodied in a print issued in 1857, which defined the object of the Society to be—"To receive, at its stated meetings, original Papers contributed by its members on subjects of science, literature, and philosophy." By a tacit agreement, which has existed all along, the discussion of party politics and sectarian differences in religious belief has not been considered to be in accordance with the objects of the Society.

Conditions of Membership.

From the commencement members and office-bearers were admitted by ballot, one vote in five, and at a subsequent period, one vote in three, being considered a vote of non-admission. During the early years of the Society it was also laid down as a condition that members should promise to contribute to the Papers of the Society, and failing to contribute, they remained subject to payment of the annual subscription after other members had ceased to do so. This restriction was found to be either impracticable or inexpedient—probably both—and was abolished. Although, strictly, admission is by ballot, the Society has, from its very first meeting, entrusted its President—subject to the approval of the other office-bearers—with the liberty of proposing the admission by acclamation of persons already distinguished as suitable for membership.

Subscription.

At an early period of the Society's history, the annual

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subscription ceased to be payable after a few years, but this was departed from. For many years the annual subscription was 5s., and is now 10s. 6d. Unless the subscription had stood at this latter amount for some years, the Society's funds would not have admitted of the donations made to various public objects from time to time, nor of the publication of this volume. The single entry subscription has varied between 10s. 6d. and 21s., at which latter point it has remained for a good many years. Honorary and Corresponding Members have never been called upon to pay any subscription.

The Places of Meeting.

According to a resolution of the Society at its commencement the meetings were held for some years in the Lemon Tree Tavern, Aberdeen, and occasionally in Old Aberdeen. In 1845, the Society migrated to the Agricultural Hall, King Street, for a few months, returning to the Lemon Tree in the same year. This arrangement seems to have been considered after all unsatisfactory, as at the December meeting of that year the Society resolved—"To discontinue meeting in a tavern." It is not, however, to be supposed that the resolution originated in anything incompatible with the nature of such a Society, as we find, what some may recollect, that each member present contributed only the sum of 6d. as his share for entertainment and accommodation. From 1855 to 1858 the Society met in the County Rooms, now the Music Hall Buildings; from 1858 to 1872, in the old Advocates' Hall; from 1872 to 1874, in the Faculty Room, Marischal College; from 1874 to 1878, in the Music Hall Buildings; and since then, in the Library, 199 Union Street, in Watson's Rooms, and in the Bath Hotel.

Other Work of the Society.

To the other work of the Society, indicated in its minutes, and which cannot be gathered directly from the mere titles of Papers read, allusion will now be made. In most cases, records of the work of the committees were not preserved by the Society, but it is quite possible that if occasion should arise, some of them might be recovered.

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In 1845, Mesmerism was exciting much public interest and inquiry, and a committee was appointed to investigate its phenomena. In January, 1846, the Society originated and carried out a scheme for the delivery of a course of twelve public lectures by members. The lectures were delivered in the Royal Hotel, and the proceeds were divided between the two industrial schools, which had shortly before been established in Aberdeen. In January, 1854, a proposal was made that a committee be appointed to inquire into the physical and intellectual condition of pauper children. After deliberation, this project was considered to be beyond the scope of the Society. In 1857, the Society resolved to hold a public conversazione, and this was carried out on the 8th and 9th May of that year, in the County Rooms, at the expense of the Society, and under the management of the members.

In 1858, the Society voted £25 to the guarantee fund of the British Association, arranged to meet in Aberdeen in 1859, and by request of the local secretaries of the Association appointed a committee of its office-bearers and members to co-operate with the local committee of the Association. At the meeting of the Association, a very effective conversazione and art exhibition were also carried out, mainly by the help of members of the Society, under the guidance of Mr. John F. White, one of their number, who also occupied the position of one of the local secretaries of the British Association. In 1861, the Society appointed a committee to collect facts regarding the ocean currents and other physical phenomena of the Arctic regions. It was considered that Aberdeen, Peterhead, and Lerwick, were convenient centres from which observations might be collected and tabulated by captains, surgeons, and officers sailing to these regions. The Society voted funds to defray the expense of books, which were distributed to captains and others. It is believed that the work proved, ultimately, to be beyond the power of the Society, but the observations reached such a stage that the committee were authorised to place them before Admiral Fitzroy; and the local interest in Arctic exploration could not fail to be strengthened by the active steps which the Society then took.

In December, 1862, a committee was appointed for the purpose of deliberating on the possibility of compiling a

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"Glossary of the Aberdeenshire Dialects." This committee prosecuted the work assigned to them, and it is hoped that the results may yet appear in the labours of individual members of the Society.

In January, 1865, a committee was appointed to organise a conversazione similar to that held in 1857. This was carried out in February in the halls of Marischal College. The expense of this, added to that of previous undertakings, left the Society in debt for a time.

In December, 1876, a committee was appointed, on the invitation of the Town Council, to co-operate in carrying out a meeting for the following year of the Social Science Congress to be held in Aberdeen.

At the March meeting, 1877, the Society voted £50 to the guarantee fund for the meeting of the Congress, and resolved to join with the Microscopical Society in organising a conversazione during the meeting. This was carried out with success. At the November meeting the Secretary had the satisfaction of announcing that the greater number of the papers read at the Congress had been by members of the Philosophical Society. The three local secretaries of the Congress were also members of the Society — Professor Milligan, and Messrs. Paul and A. D. Milne.

In November, 1878, Sir Arthur H. Gordon, K.C.M.G., Governor of Fiji, addressed the Society in the Town-Hall, and was elected an honorary member.

In 1880 an Exhibition of Appliances for the use of gas, oils, electricity, &c., in lighting, heating, and cooking, was projected by members of the Town Council and other citizens. A local committee was appointed, of which the greater number were members of the Society. The Society subscribed £50 to the guarantee fund, and, by request, took charge of the undertaking, the Secretary making the necessary arrangements, along with two other members, Messrs. John Miller and Alex. Smith. The University granted the halls of Marischal College for the purpose, and the exhibition was considered a success in every respect. It extended over a fortnight, 20,000 persons visited it from the city and from all parts of the adjacent counties, and 4000 copies of the descriptive catalogue were circulated. The balance of funds, after paying

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all expenses, amounted to £55, and was handed over to the Art Gallery Fund then being raised.

Following up a Paper on Cunningham's positive system of ventilation, read by Mr. Miller in February, 1883, the Society appointed a committee of five of its members to co-operate with the School Board in investigating the whole subject of the ventilation of our Board schools. The committee has been engaged in this work, and has now arranged and presented an interim report.

In March, 1883, on the occasion of Mr. J. D. Milne reading a Paper to the Society on Free Libraries, the Society resolved, in addition to including the Paper in the printed proceedings, to distribute it among the citizens. 10,000 copies were printed and circulated at the expense of the Society, and the Act has since been adopted by the city.

Such is a brief *resumé* of the public work of the Society. Keeping in view what has been now said, and looking at the list of Papers, and the names of the contributors, it will be seen that there has been no conflict between "Town and Gown." The Society, originated by members of the University and a few others of like tastes, has all along reckoned among its active members and its firm friends many belonging to our highest teaching profession. I will not incur the risk which would be involved in the invidious mention of names which a mere perusal of the lists will recall to many members—they remind us of many of the departed who have conferred lustre on our University and City, and of many who are still with us, not less illustrious.

At the same time it will be observed that from its earliest years the Society gathered into its membership citizens from all professions and all classes. Conspicuous among these are the Medical Profession, who, although they have a special organisation of their own—the Medico-Chirurgical Society, now nearly of centenarian age—have all along shown their sympathy with the more cosmopolitan work of the Philosophical Society, and have contributed materially to its usefulness. The Legal Profession have also, and in some cases conspicuously, shown a lively interest in the Society's proceedings and work. But all along, and not less at the present time, the general body of citizens have held their ground, both in numbers and in the value of their contributions. And this is as

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it should be. The professions exist, as such, for the benefit of the general community, and it is a matter of history and experience that learning and culture have their firmest hold, not on classes, but on individuals. Some of our greatest names in science in all ages have been closely connected with the ordinary avocations of life—with commerce and trade—and have been, at the same time, among its greatest benefactors; while from time to time the world is called upon to do honour to workers in the humblest spheres of life, who have risen above their outward circumstances to vindicate the fact that in all departments of knowledge special genius is indispensable to special excellence.

It has sometimes been said of Societies similar to ours, such as those of Glasgow, Liverpool, &c., that they embrace too wide a field—that they should devote their efforts to a special branch of knowledge. The contrary is, however, found to be the case, for the Societies of these towns, and of others, have continued to maintain a constitution similar to our own. At the same time, they have in each case encouraged the formation of other Societies, or branches of the parent Society, for special subjects, such as mathematics, astronomy, natural history, the microscope, &c. Our experience has been somewhat similar. From time to time the members of our Society interested in such subjects have found themselves numerous enough to form other Societies for the special study of these. One of the first formed here of this nature was the Microscopical, but, although carried on with vigour for a time, it passed away a few years ago. Another Society was formed for the study of Natural History as a specialty, and it promises to have a successful career. It includes many of those specially interested in the Microscope. And following up a Paper read in November, 1872, by Professor Geddes, "On Local Aspects of the Fine Arts," and which forms the first of the printed Papers in this volume, the St. Nicholas Association has been formed, having for its objects—To protect and advance the amenity of the city of Aberdeen and its neighbourhood; to preserve objects of antiquarian, historical, or artistic interest in the city and neighbourhood; to promote the means of open-air recreation for its inhabitants; and to support the Magistrates and Town Council in their endeavours to attain these objects. The Philosophical Society seems therefore to fill a distinct place of

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usefulness on its present broad foundations—including in its objects learning and science in their widest meaning, and in its membership all classes of the community. Nor can it be said that it would add to the strength or usefulness of the Society if each member were required or expected to contribute Papers, for without having done so each may, in his own circle, become a centre of intelligence, as regards the subjects discussed, and may thus benefit the community. As a reason that the catholic constitution of the Society should be firmly maintained, it may be further urged that, in these days of large towns, there are interests most important to the general community which have, necessarily, to be entrusted to men who have not had the benefit of the highest classical, literary, or scientific training. It is manifestly to their advantage that they should become acquainted with those of the community who have been more fortunate, and it is as manifest that the special practical knowledge which they acquire in the discharge of important official duties should be laid before the public from time to time through such a channel as the Society presents, either by contributing to its papers or by taking part in its discussions.

It would be idle to attempt, even though it were possible, to determine *how far* the Society has helped, in any important respects, to forward the progress of those who have taken, in subsequent years, an honourable place in science, literature, philosophy, history, or social and educational questions. Yet it may be hoped and believed that the earlier essays of such members as have afterwards been useful by their teaching, their writings, or their public services, made in a familiar field and with an audience fit, though few, have contributed to prepare them for attempts and successes in wider fields. Much more must this have been the case with humbler workers outside the learned professions, who had, and have little opportunity, save in such a Society, of finding an audience at once sympathetic and respectful.

It may be added that one of the functions of the Society, and that not an unimportant one, has been to maintain successfully amongst its members, in all its discussions and criticisms, an attitude of kindness and gentlemanly courtesy. For this quality our Society, up to this time, has been favourably known.

In connection with the periodical excursions of the Society,

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the members have been indebted to Dr. Alexander Cruickshank for interesting historical and archæological notes on each occasion since 1868.

It would not be difficult, through the list of Papers and contributors, to trace how the advance of science, in philosophical investigation, in historical enquiries, in social questions, in education, and in other respects, has been reflected in the transactions of the Society. I may further say that its work has not been confined to reflection alone, for in some of its individual members the Society has never lacked original thinkers.

One of the most pleasing features in the history of the Society has been that a remarkably large number of its members have, at a later period, been called to occupy important positions both in our midst—in the University and in other public bodies—and elsewhere, in equally useful and honourable spheres.

To such especially, and to all other members, it is hoped that the present volume may form a pleasant *souvenir* of profitable evenings. One, only, of the original members, Dr. Francis Ogston, the respected Emeritus Professor of Logic and Medical Jurisprudence, remains of the professional group who originated the Society. The only other professional member—of the original number—surviving at the commencement of this session, Dr. Allen Thomson, long an ornament of the Glasgow Philosophical Society, died while this volume was in the press. Of the citizens, one only remains—now living in retirement—Mr. Robert Davidson, chemist, the ingenious inventor of the first electro-motive machine.

Twenty years ago, when the present secretary entered on his duties, the Society numbered 80 ordinary members; now, by steady increase, it numbers 150. About ten years ago the Society for the first time agreed to its proceedings being reported, with the consent of those presenting the Papers. Both these changes—in numbers and in publicity—must have added to any public influence for good exerted by the Society.

The progress of the Society has been, upon the whole, in the direction of opening up both its meetings and proceedings to the public. From the first, visitors were occasionally present—introduced by members—the understanding being that each member might introduce one friend. In 1864, a resolution was passed that that friend might be a lady, and although in 1863 a pause

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was made in the election of members, and the number of ordinary members restricted to 80, the restriction was removed after a few years.

From time to time inquiry has been made by publishers and others as to Papers read before the Society at an early period, and whether they can now be had in a printed form. Some of the Papers not contained in full in this volume were published in a separate form, others formed part of larger works, and others were communicated to scientific journals. To have given this information with any degree of accuracy in the list, would have involved much careful inquiry, but it might be attempted at another time.

A. D. M.

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ABERDEEN PHILOSOPHICAL SOCIETY.

PAPERS READ BEFORE THE SOCIETY, MEMBERS ADMITTED, &c., FROM 1840 TO 1884.

PRELIMINARY MEETING,

11TH JANUARY, 1840.

Chairman—Dr. FLEMING.

AT a Meeting held in Professor Gregory's house, and attended by Professors Fleming, Pirrie, Thomson, and Gregory; Dr. A. Kilgour, Mr. A. Moir, Mr. J. Shier, Mr. G. Dickie, Lecturers; and Mr. R. Davidson;

It was agreed that a Society be constituted of the Cultivators of Science in and around Aberdeen, to be termed the Aberdeen Philosophical Society, and that the first meeting of the Society should be held in the Lemon Tree, on Friday, the 17th, at 8 P.M.

17TH JANUARY, 1840.

The following were elected Office-Bearers :—

President—Dr. FLEMING.

Vice-Presidents—Dr. ALLEN THOMSON and Dr. CLARK.

Secretary—Dr. GREGORY. | *Treasurer*—Dr. A. MOIR.

Jan. 17, 1840.

The following Original Members were elected :—

John Fleming, D.D., Professor of Natural Philosophy, King's College. (Afterwards Professor of Natural Science in Free Church College, Edinburgh.)

Allen Thomson, M.D., Professor of Anatomy, Marischal College. (1884.—LL.D., D.C.L., F.R.S., F.R.S.E., Hon. Member, Emeritus Professor of Anatomy in Glasgow University, and President of the British Association, 1877.)

Wm. Gregory, M.D., Professor of Medicine and Chemistry, King's College. (Afterwards Professor of Chemistry, Edinburgh University.)

Geo. Dickie, M.A., Surgeon, Lecturer on Botany, King's College. (Afterwards M.D., Professor of Botany in Aberdeen University.)

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Francis Ogston, M.D., Lecturer on Medical Jurisprudence, Marischal College. (1884.—Hon. Member, Emeritus Professor of Logic and Medical Jurisprudence in Aberdeen University.)

Wm. Pirrie, C.M., M.D., Professor of Surgery, Marischal College. (Afterwards LL.D., F.R.S.E., Professor in Aberdeen University, and President, Medico-Chirurgical Society.)

Alex. Kilgour, M.D., Lecturer on Practice of Medicine, King's College. (Afterwards President, Mechanics' Institute, and Assessor, University.)

Robt. Davidson, Chemist.

Thos. Clark, M.D., Professor of Chemistry, Marischal College.

John Shier, M.A., Lecturer on Agriculture, Marischal College. (Afterwards LL.D., Agricultural Chemist to the Colony of British Guiana.)

And. Moir, M.D., Lecturer on Anatomy and Physiology, King's College.

David Kerr, M.D., Lecturer on Surgery, King's College.

First Session, 1840.

Feb. 7, 1840.

Papers read:—

On the Formation of a Harbour of Refuge on the East Coast of Scotland, between Fifeness and Kinnaird Head; and,

On a Vein of Animal Origin occurring on the Reef of Rocks, called Skerry Vore, on the West Coast of Scotland.

Professor FLEMING.

On Lactic Acid, as occurring in Animal Fluids. Professor GREGORY.

On the Nature and Properties of Fecula. Dr. DICKIE.

March 6.

On the Branchial Appendages in the Fœtus of the Skate, and on the Reproduction of Fishes, particularly of the Cartilaginous Tribes. Professor THOMSON.

On the New Compounds discovered by Liebig and Wöhler in their researches in Uric Acid. Professor GREGORY.

April 3.

On the Different Species of Cetacea found on the Coast of Aberdeenshire. Mr. SHIER.

On an Error in the Ordinary Computations of Absolute and Apparent Expansion; and,

On a New Power, apparently developed in the Apparatus for Bleaching Patterns in Calico, by forcing the Liquor through holes in the Plates employed when short tubes were attached to the Perforations in the Plates. Dr. CLARK.

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April 3, 1840.

During the Session the following election was also made :—

Rev. Jas. Leslie, M.A. (Afterwards Parish Minister of Coull.)

Second Session, 1840-1841.

Nov. 6.

Papers read :—

On the Geology of the Neighbourhood of the Town of Aberdeen. Professor FLEMING.

On the occurrence of Cobalt and Nickel in the Ores of Manganese. Professor GREGORY.

Dec. 4.

The following were elected Office-Bearers :—

President—Dr. FLEMING.

Vice-Presidents—Dr. ALLEN THOMSON and Dr. CLARK.

Secretary—Dr. GREGORY. | *Treasurer*—Dr. A. MOIR.

Papers read :—

On the Anatomy, Comparative Anatomy, and Functions of the round Ligament of the Hip Joint. Dr. ANDREW MOIR.

On the Physical Character of the Higher Mountains of Aberdeenshire, with reference particularly to the Existence of numerous large Flat Slabs of Rock near the Summits. Dr. DICKIE.

Jan. 8, 1841.

On the Intermaxillary Bones in Man and Animals. Professor THOMSON.

On the Preparation of Chemically pure Muriatic Acid of any desired strength. Professor GREGORY.

On the Simple Minerals found in the Vicinity of Aberdeen. Mr. SHIER.

Feb. 5.

On the Manganese Mine at Grandholm, in the neighbourhood of Aberdeen ; and,

On Mr. Thom's Method of Purifying Moss Water by Filtration through Pounded Amygdaloid. Professor FLEMING.

March 6.

On the Structure of the Shell of the Egg, and on the Nature and Seat of the Colouring Matter. Dr. DICKIE.

April 9.

On the Appearances presented by the Bodies of the Five Persons who perished in a Recent Fire in York Place, Aberdeen. Dr. OGSTON.

On the *Salmo trutta* and *Salmo albus*. Mr. SHIER.

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During the Session the following were elected Members :—

Dec. 4.

(*Hon.*) Sir George Sinclair, Bart., Lord Rector, Marischal College.
„ Sir T. M. Brisbane, Bart., G.C.B., P.R.S.E.
„ Professor Liebig, of Giessen.
Robt. Dyce, M.D., Lecturer on Midwifery in Marischal College. (Afterwards Professor of Midwifery in Aberdeen University.)
(*Hon.*) The Duke of Richmond, Chancellor, Marischal College.
„ The Earl of Aberdeen, Chancellor, King's College.
„ Lord Francis Egerton, Lord Rector, King's College.

Jan. 8, 1841.

Stephen Balfour, M.D.
Rev. John Morgan, M.A., Murray Lecturer, King's College.
Francis H. Nichol, Surgeon.
(*Cor.*) Francis Adams, Surgeon, Banchory-Ternan. (Afterwards LL.D.)
(*Hon*) Walter C. Trevelyan, F.R.S.E.

Feb. 5.

Wm. Jack, D.D., Principal, King's College.
Daniel Dewar, LL.D., D.D., Principal, Marischal College.
Robt. Jamieson, M.A., M.D. (1884.—Physician to the Royal Lunatic Asylum, Aberdeen, Ex-President, Medico-Chirurgical Society,)

March 6.

(*Hon.*) Sir Jas. M'Grigor, Bart., M.D., Lord Rector, Marischal College.

April 9.

Wm. Templeton, M.A., Surgeon, Lecturer on Institutes of Medicine, King's College. (1884.—M.D., Hon. Member.)
Wm. Watson, W.S., Sheriff-Substitute of Aberdeenshire. (1884.—Hon. Member.)
(*Cor.*) Rev. George Gordon, M.A., of Birnie. (1884.—LL.D., Hon. Member.)
„ Patrick Duff, of Elgin.

Third Session, 1841-1842.

Nov. 5, 1841.

Paper read :—

On the Results obtained by Seven Rain Gauges in the Vicinity of Aberdeen. Dr. DICKIE.

Dec. 3.

The following were elected Office-Bearers :—

President—Dr. FLEMING.
Vice-Presidents—Dr. CLARK and Mr. SHIER.
Secretary—Dr. GREGORY. | *Treasurer*—Dr. A. MOIR.
Artist—Mr. J. TROUP.

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Papers read :—

On Testing Impurities in Water, and on the Purification of Water from Supercarbonate of Lime and other Earthy Salts.
Dr. CLARK.

On the *Spatangus Cordatus*, or *Amphidotus Cordatus*.
Mr. LESLIE.

Jan. 7, 1842.

On the Native Birds observed in the District of Banchory-Ternan.
Dr. ADAMS.

On the Influence of Physical Temperament on the Phenomena of Mental Disease. Dr. JAMIESON.

On the State and Prospects of Animal Chemistry.
Professor GREGORY.

Feb. 4.

On the Algæ, with a Catalogue of the Species found on the Coast of the Counties of Aberdeen and Kincardine. Dr. DICKIE.

On the History of British Weights and Measures. Dr. CLARK.

March 4.

On the Act relating to Weights and Measures. Professor FLEMING.

On the Structure of the Lepidosteon, forming a Link between Fishes and Amphibia. Dr. LIZARS.

On the Philosophical Principles of Translation.
Professor BLACKIE.

April 8.

On the Ordinary System of Rotation of Crops in this Country.
Mr. SHIER.

On Liebig's Animal Chemistry and Physiology.
Professor GREGORY.

May 6.

Do. do. concluding part. Professor GREGORY.

On the Chemical Process for detecting Arsenic. Dr. CLARK.

During the Session the following were elected Members :—

Dec. 3.

James Troup, Artist.

John Stuart Blackie, M.A., Professor of Humanity, Marischal College. (1884.—F.R.S.E., Hon. Member, Emeritus Professor of Greek Edinburgh University.)

Alex. J. Lizars, M.D., Professor of Anatomy, Marischal College.

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March 4, 1842.

Thomas Best, Merchant.
Alex. Stuart, M.A., of Laithers.
Wm. S. B. Lee, Aberdeen.

May 6.

Alex. Cruickshank, M.A. (1884.—LL.D.)
W. Macgillivray, M.A., Lecturer on Botany, Marischal College. (Afterwards LL.D., and Professor of Natural History.)

Nov. 18.

Robt. Taylor, Music Saloon.

Fourth Session, 1842-1843.

Nov. 18.

Papers read :—

On Mollusca found in the Vicinity of Aberdeen.
Professor MACGILLIVRAY.

On the Forest Trees of Aberdeenshire. Dr. DICKIE.

Dec. 2.

The following were elected Office-Bearers :—

President—Dr. FLEMING.
Vice-Presidents—Dr. CLARK and Mr. SHIER.
Joint-Secretaries—Dr. GREGORY and Mr. LESLIE.
Treasurer—Dr. A. MOIR.

Papers read :—

On Experiments with various Manures. Mr. SHIER.

Jan. 6, 1843.

An attempt to Generalize and trace to one sole cause—viz., the Liberation of Latent Heat—all cases of Terrestrial Heat.
Mr. BAIN.

On the Swiss Glaciers. Professor FLEMING.

Feb. 3.

On a New Molluscous Animal, allied to *Æolis* and *Tritonia*.
Professor MACGILLIVRAY.

On the White Stork. Mr. LESLIE.

March 3.

On the Rhythmical Modulation of the Ancients.
Professor BLACKIE.

April 7.

On the Health of the Poor, chiefly with reference to Fever.
Dr. TEMPLETON.

On the Limits of Vegetation in Aberdeenshire. Dr. DICKIE.

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During the Session the following were elected Members :—

Dec. 2, 1842.

Alex. Bain, M.A. (1884.—Hon. Member, LL.D., Emeritus Professor of Logic, Aberdeen University, and Lord Rector; Ex-Member, School Board.)

James Booth, M.B. (1884.—M.D.)

Jan. 6, 1843.

Andrew Findlater, M.A., Head Master of Gordon's Hospital. (1884.—LL.D., Hon. Member, Editor of Chambers' Encyclopædia, &c., &c.)

J. P. Walker, M.D. (1884.—Hon. Member.)

Feb. 3.

(*Hon.*) Dr. Montague, Paris.

April 7.

Alexander Harvey, M.A., M.D. (Afterwards Professor of Materia Medica in Aberdeen University, and President, Medico-Chirurgical Society.)

Fifth Session, 1843-1844.

Nov. 3.

Paper read :—

On the Atomic Weight of Hydrogen. Dr. CLARK.

Dec. 1.

The following were elected Office-Bearers :—

President—Dr. CLARK.

Vice-Presidents—Dr. FLEMING and Professor BLACKIE.

Joint-Secretaries—Dr. GREGORY and Mr. LESLIE.

Treasurer—Dr. A. MOIR.

Papers read :—

On a New Classification of the Sciences. Mr. BAIN.

On a Vital Process in the Function of Nutrition, apart from that of Chemical Action; and on Vital Attraction as its cause, as distinguished from Vital Affinity concerned in effecting the Chemical part of that action. Dr. HARVEY.

Jan. 5, 1844.

On Vegetable Reproduction. Dr. DICKIE.

On Drs. Fresinius and Will's new methods of Alkalimetry. Mr. W. S. B. LEE.

Feb. 2.

On the Principles of Poetic Translation. Dr. ADAMS.

On a New Cuttle Fish, found at Aberdeen. Professor MACGILLIVRAY.

On the Principles by which Sound is regulated, especially in large Buildings. Mr. SHAND.

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March 2.
On the Principles of Education. — Mr. FINDLATER.
March 29.
On Crystallization. — Dr. FLEMING.
On Sound (concluding paper). — Mr. SHAND.
On the Theory of the Beautiful. — Professor BLACKIE.

During the Session the following were elected Members :—
Nov. 3.
John Urquhart, Druggist.
Dec. 1.
John Davidson, M.A., Teacher of Mathematics. (1884.—D.D., Hon. Member, Parish Minister of Inverurie.)
Jan. 4, 1844.
W. Shand, Old Aberdeen.

Sixth Session, 1844-1845.

Nov. 8.
Paper read :—
On an Artificial Cave in the Parish of Cluny, supposed to be of Pictish origin. — Mr. LESLIE.

Dec. 9.
The following were elected Office-Bearers :—
President—Dr. SHIER.
Vice-Presidents—Professor BLACKIE and Sheriff WATSON.
Secretary—Mr. BAIN. | *Treasurer*—Mr. BEST.

Papers read :—
On the use of Steeps for Seed. — Dr. DICKIE.
On the Definition and Classification of the Human Senses. — Mr. BAIN.

Jan. 3, 1845.
On Guano. — Professor SHIER.

Feb. 7.
On Mesmerism. — Dr. WALKER.

March 7.
On the Grasses and Vegetable Productions of the Falkland Islands. — Dr. DICKIE.
On the Management of the Poor. — Baillie URQUHART.

April 4.
On the Scottish Universities. — Professor BLACKIE.

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During the Session the following were elected Members :—

Nov. 8.

Alex. Mitchell, M.A., Bookseller. (1884.—D.D., Minister, Dunfermline, Hon. Member.)

Dec. 9.

Wm. Pirie Smith, M.A., Rector, West-End Academy. (1884.—D.D., Hon. Member, Retired Minister of Free Church, Keig and Tough.)

Andrew Fyfe, M.D., Professor of Chemistry, King's College. (Afterwards Professor in Aberdeen University, and President, Mechanics' Institute.)

Feb. 7, 1845.

John Blaikie, Advocate.

March 7.

John Duguid Milne, Jun., M.A., Advocate. (1884.—Hon. Member, Ex-President, Mechanics' Institute.)

Seventh Session, 1845-1846.

Dec. 5.

The following were elected Office-Bearers :—

President—Professor BLACKIE.

Vice-Presidents—Dr. DICKIE and Dr. HARVEY.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. BEST.

Papers read :—

On the Laws of the Derivation of the Qualities of Progeny from their Parents. Mr. J. D. MILNE.

Jan. 2, 1846.

On the prevailing Potato Disease. Dr. DICKIE.

On the Physiology of Plants. Dr. HARVEY.

Feb. 6.

On the Duration of Life in Plants, with reference chiefly to the Nature and Longevity of Trees. Dr. HARVEY.

March 6.

On the Logic of the Art of Education. Mr. FINDLATER.

April 3.

On Imperfect Mental Action. Dr JAMIESON.

During the Session the following Election was made :—

March 6, 1846.

George Walker, M.A., Writer. (1884.—Advocate, Aberdeen.)

June.

Excursion to Cove.

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Eighth Session, 1846-1847.

Paper read :—

Nov. 3.

On the Principal Statistical Results contained in the Reports of the Registrar-General for England. Mr. J. D. MILNE.

Dec. 4.

The following were elected Office-Bearers :—

President—Professor BLACKIE.

Vice-Presidents—Dr. DICKIE and Dr. TEMPLETON.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. BEST.

Papers read :—

On the Theology of the Greeks, as exhibited in the "Prometheus Bound" of Æschylus. Professor BLACKIE.

Jan. 8, 1847.

On the Arctic Regions. Dr. TEMPLETON.

Feb. 5.

On the Latin Poems of Jacob Balde. Professor BLACKIE.

March 5.

On the Hypothesis of Spontaneous Generation. Dr. DICKIE.

On the Unit or Proximate Atom of Society. Mr. FINDLATER.

April 1.

On the Connection subsisting between Physical Science and Religion. Rev. Mr. RITCHIE.

During the Session the following were elected Members :—

Dec. 4.

Peter Abel, M.D. (Afterwards Inverurie.)

Jan. 8, 1847.

John Christie, M.D.

Rev. J. B. Ritchie, Aberdeen.

Feb. 5.

Edward Craig, Teacher.

Rev. Wm. Martin, M.A., Professor of Moral Philosophy and Logic, Marischal College. (Afterwards LL.D., Professor of Moral Philosophy in the University, Aberdeen.)

Mar. 5.

James Grant, Stamp Office.

David Gray, M.A., Professor of Natural Philosophy, Marischal College.

June.

Excursion to Dunnottar and Fetteresso.

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Ninth Session, 1847-1848.

Nov. 5.

Paper read :—

On Systematising Emotional Culture. Mr. J. D. MILNE.

Dec. 3.

The following were elected Office-Bearers :—

President—Professor MARTIN.

Vice-Presidents—Dr. HARVEY and Dr. JAMIESON.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Baillie JOHN URQUHART.

Papers read :—

On the Philosophy of Kant. Mr. CRAIG.

Jan. 7, 1848.

On National Education. Mr. FINDLATER.

Feb. 4.

On the Siliceous Infusoria of Ehrenberg. Dr. DICKIE.

March 3.

On the Agrarian Laws of the Romans. Professor BLACKIE.

During the Session the following were elected Members :—

Nov. 5.

Rev. S. M'Intosh, D.D., East Parish Church.

Jan. 7, 1848.

H. Ambrose Smith, Actuary. (1884.—Hon. Member, Ex-President, Mechanics' Institute.)

Tenth Session, 1848-1849.

Nov. 3.

Paper read :—

On the Propriety of admitting the Female Sex into a larger share of Non-domestic Industry. Mr. J. D. MILNE.

Dec. 1.

The following were elected Office-Bearers :—

President—Professor MARTIN.

Vice-Presidents—Dr. HARVEY and Dr. JAMIESON.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Baillie JOHN URQUHART.

Papers read :—

On Some of the Changes which obscure Personal Identity. Dr. JAMIESON.

Jan. 5, 1849.

On the Nature of the Connection between Life and Organisation. Dr. HARVEY.

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Feb. 2.

On the Propriety of admitting the Female Sex into a larger share of Non-domestic Industry (second part). Mr. J. D. MILNE.

March 9.

On the Moral and Mental Improvement of Female Domestic Servants. Baillie JOHN URQUHART.

April 5.

On Biology. Mr. ALEX. CRUICKSHANK.

During the Session the following were elected Members :—

Jan. 5, 1849.

John Smith, M.A., M.D., Lecturer on Chemistry and Agriculture, Marischal College. (1884.—LL.D., Hon. Member, Professor of Experimental Physics and Chemistry, University of Sydney, and Member of the Legislative Council.)

Feb. 2.

David Mackintosh, M.D., Lecturer, Institutes of Medicine.

Mar. 9.

Norval Clyne, M.A., Advocate. (1884.—Hon. Member.)

Nov. 9. Eleventh Session, 1849-1850.

Paper read :—

On the Theology of the Homeric Writings. Professor BLACKIE.

Dec. 7.

The following were elected Office-Bearers :—

President—Dr. CLARK.

Vice-Presidents—Mr. WATSON and Dr. TEMPLETON.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Baillie JOHN URQUHART.

Papers read :—

On the Influences of Industrial Schools on the Moral and Physical Constitution of Pauper Children. (Communicated by Sheriff WATSON.) Mr. STRATTON.

Jan. 11, 1850.

On the Connection between Vice and Deficient Sanitary Arrangements. Dr. TEMPLETON.

Feb. 1.

On the Proximate Laws by which the Muscles attain the positions they severally hold in the Animal Frame. Mr. J. D. MILNE.

March 8.

On Biology. Mr. A. CRUICKSHANK.

April 5.

On Mental States in either Parent, as influencing the Fœtus *in Utero*. Dr. HARVEY.

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During the Session the following were elected Members :—

Jan. 11, 1850.

Peter Redfern, M.D., Lecturer on Anatomy and Physiology, King's College. (1884.—F.R.C.S., Professor of Anatomy and Physiology, Queen's College, Belfast; Ex-President, Medico-Chirurgical Society, Aberdeen.

G. B. Bothwell, Dean of Guild.

John Watt, Advocate.

Feb. 1.

John F. White, M.A., Merchant. (1884.—F.S.A., Scot., Assessor for the General Council in the Aberdeen University Court.)

James Stratton, Bookseller. (Sometime President of the Aberdeen Phrenological Society.)

Twelfth Session, 1850-1851.

Nov. 8.

Paper read :—

On the Genius and Character of the Romaic or Modern Greek Language. Professor BLACKIE.

Dec. 6.

The following were elected Office-Bearers :—

President—Dr. CLARK.

Vice-Presidents—Mr. WATSON and Dr. TEMPLETON.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Baillie JOHN URQUHART.

Papers read :—

On the Antagonism between the Mechanical, Chemical, and Vital Forces in Living Bodies. Dr. CHRISTIE.

Jan. 3, 1851.

On the more obvious Functions of the Nervous Centres. Dr. REDFERN.

Feb. 7.

On Subjective and Objective Truth. Mr. J. D. MILNE.

March 9.

On the Chemical Composition of the Waters of the Dee and Don. Dr. JOHN SMITH.

April 4.

On the Cultivation of the Sugar-Cane. Dr. SHIER.

During the Session the following were elected Members :—

Dec. 6.

Wm. D. Geddes, M.A., Teacher, Grammar School. (1884.—LL.D., Hon. Member, Ex-Rector, Aberdeen Grammar School, Professor of Greek, Aberdeen University, and Assessor for the Senatus in the University Court.)

Chas. Duncan, Advocate. (1884.—Procurator-Fiscal of Aberdeenshire.)

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April 4, 1851.

Robert Beveridge, M.A., M.B. (1884.—Hon. Member, Ex-President, Medico-Chirurgical Society; Physician and Lecturer, Royal Infirmary.)

John C. Botham, Student of Medicine. (Afterwards M.D.)

June.

Excursion to Fettercairn and Gannochie, and the Burn.

Thirteenth Session, 1851-1852.

Nov. 7.

Paper read:—

On Animal Magnetism, the Influence of Chloroform, &c., as illustrating Mental Philosophy. Mr. J. D. MILNE.

Dec. 5.

The following were elected Office-Bearers:—

President—Professor MARTIN.

Vice-Presidents—Dr J. SMITH and Dr. REDFERN.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. H. AMBROSE SMITH.

Papers read:—

On the Stereoscope. Professor MARTIN.

Jan. 9, 1852.

Analytical View of the Vital Actions and Vital Powers of Living Beings. Dr. HARVEY.

Feb. 6.

On the Topography of the Arctic Regions, considered especially with reference to the existence of a North-West Passage. Dr. BEVERIDGE.

March 5.

On the Dental Tissues in Man and Animals, with a few remarks on some of the more closely allied Structures. Dr. REDFERN.

April 2.

On the Incrustation found in the Iron Water-Pipes of Aberdeen, with Observations on a similar deposit occurring in Earthen Drain-Pipes. Dr. J. SMITH.

During the Session the following were elected Members:—

Jan. 9, 1852.

A. D. Scott, Aberdeen.

Feb. 6.

George Davidson, Bookseller.

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Mar. 5.

Wm. B. Ferguson, Architect.

Rev. James Farquharson, M.A., Assistant Lecturer on Natural History, Marischal College. (Afterwards Minister, Selkirk.)

Lieutenant Skues, Aberdeen.

Frederick Fuller, M.A., Professor of Mathematics, King's College. (Afterwards Professor of Mathematics, Aberdeen University, and Assessor for the Senatus in the University Court.)

Alexander Ross, Student of Medicine.

Rev Alex. Beverley, M.A., Teacher, Grammar School. (1884.—LL.D.)

June.

Excursion to Haddo House and Braes o' Gight.

Fourteenth Session, 1852-1853.

Nov. 5.

Paper read :—

On the Process of Secretion. Dr. REDFERN.

Dec. 3.

The following were elected Office-Bearers :—

President—Professor MARTIN.

Vice-Presidents—Dr. REDFERN and Dr. BEVERIDGE.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. H. AMBROSE SMITH.

Papers read :—

Theory of Muscular Development (second part). Mr. J. D. MILNE.

Feb. 4, 1853.

On Arithmetical Scales, and the Arithmetic of the Ancients, more especially of Archimedes. Mr. GEDDES.

March 4.

On a case of Congenital Malformation in the Calf. Dr. BEVERIDGE.

April 1.

On the Vinegar-Plant—its Botanical Nature, and the Process for Manufacturing Vinegar from it. Dr. FRASER.

During the Session the following were elected Members :—

Nov. 5.

David McHardy, Aberdeen. (1884.—Ex-President, Mechanics' Institute ; Ex-Member, School Board.)

Dec. 3.

James S. Brazier, Lecturer on Chemistry, Marischal College. (1884.—F.C.S., Hon. Member, Professor of Chemistry, Aberdeen University.)

R. H. Baker, Teacher of Music.

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Jan. 14, 1853.

Isaac Gilchrist, M.D., Woodside.

Alexander Cameron, Lecturer on Greek, King's College.

Wm. Fraser, Surgeon. (1884.—Ex-President, Medico-Chirurgical Society.)

Feb. 4.

Immanuel Schmidt, Ph.D., Teacher of Languages. (1884.--Hon. Member.)

June.

Excursion to Haddo House and Fyvie Castle.

Fifteenth Session, 1853-1854.

Nov. 4.

Paper read :—

On the Condition of Pauper Children. Mr. STRATTON.

Dec. 9.

The following were elected Office-Bearers :—

President—Dr. REDFERN.

Vice-Presidents—Mr. GEDDES and Professor MARTIN.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. H. AMBROSE SMITH.

Papers read :—

On the Claims of Anatomy as a Subject of Philosophic and General Study, illustrated by an Exposition of the Philosophic Views now entertained of the Structure of the Vertebrate Skeleton. Dr. REDFERN.

Jan. 13, 1854.

On the Importance of the Study of Experimental Science in a National point of view. Mr. BRAZIER.

Feb. 3.

On the Social Position of a Trading Burgess in the Fifteenth Century. Mr. NORVAL CLYNE.

March 3.

On the Moral Sense. Mr. J. D. MILNE.

April 7.

On the Beard. Dr. WM. FRASER.

During the Session the following were elected Members :—

Dec. 9.

Alexander Ewing of Tartowie.

Robert M'Clure, M.D., Professor of Humanity, Marischal College. (Afterwards LL.D., and Professor in Aberdeen University.)

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Jan. 13, 1854.

George Walker, Bookseller.

Feb. 3.

John Miller, Chemist. (1884.—Ex-President, Mechanics' Institute; Ex-Chairman, School Board.)

H. A. Dewar, Surgeon-Dentist. (Sometime President, Mechanics' Institute.)

James Matthews, Architect. (1884.—Lord Provost of Aberdeen; Ex-Chairman, Mechanics' Institute; Ex-Member, School Board.)

Mar. 3.

James Lazenby, Teacher.

April 7.

James Augustus Sinclair, Accountant. (1884.—C.A., F.S.A., Scot.)

Wm. F. Ogg, Advocate.

May 27.

Excursion to Mount Battock. Owing to cloud on the mountain, the ascent was not attempted, the party visiting instead the old Castle of Birse, while a few made the ascent of Peter Hill.

Sixteenth Session, 1854-1855.

Nov. 10.

Paper read:—

On the Microscopical and other Characters of Coal. Dr. REDFERN.

Jan. 12, 1855.

The following were elected Office-Bearers:—

President—Dr. REDFERN.

Vice-Presidents—Mr. GEDDES and Professor MARTIN.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. H. AMBROSE SMITH.

Papers read:—

Remarks on the Statistics of Cholera in Aberdeen.

Mr. Sheriff WATSON.

Feb. 2.

On the Action of Chloroform. Dr. BEVERIDGE.

March 2.

On Memory. Mr. H. A. DEWAR.

March 30.

On the Application of Town Sewage to Agricultural Purposes.

Mr. JOHN MILLER.

During the Session the following were elected Members:—

Nov. 10.

Peter Duguid, Writer. (1884.—Advocate, Aberdeen.)

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Jan. 12, 1855.
Wm. M'Combie, Editor, *Free Press.*
Feb. 2.
James Abernethy, C.E.
George Grub, M.A., Advocate. (1884.—LL.D., Hon. Member, Professor of Law, Aberdeen University.)
James Walker, Wine Merchant.
Mar. 30.
Alexander Simpson, Sen., Advocate. (1884.—Ex-Member, School Board.)
Wm. Paul, Advocate.

May 26.
Excursion to Glamis Castle.

Seventeenth Session, 1855-1856.

Nov. 2.
Paper read :—
Popular Illustrations of the Doctrine of Probabilities.
Mr. H. AMBROSE SMITH.

Dec. 7.
The following were elected Office-Bearers :—
President—Mr. BRAZIER.
Vice-Presidents—Mr. BOTHWELL and Dr. REDFERN.
Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. H. AMBROSE SMITH.
Papers read :—
On Medical Statistics and the Registration Act. Dr. FRASER.
Jan. 11, 1856.
Life—what is it? Dr. CHRISTIE.
Feb. 8.
On the Education of Pauper Children. Mr. Sheriff WATSON.
March 7.
On the Life of Bishop Elphinstone. Mr. G. GRUB.
April 4.
On the Right Constituents of a Common Education.
Mr. WILLIAM M'COMBIE.

During the Session the following were elected Members :—
Mar. 7, 1856.
Rev. James Forsyth, D.D., West Parish Church.

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April 4.

Waller Evans, Rector, Grammar School, Aberdeen.
James Westland, Banker. (Sometime President, Mechanics' Institute.)

June.

Excursion to Benachie.

Eighteenth Session, 1856-1857.

Nov. 14.

Paper read :—

On Law and Litigation. Mr. J. D. MILNE.

Dec. 12.

The following were elected Office-Bearers :—

President—Dr. REDFERN.

Vice-Presidents—Mr. GRUB and Mr. BOTHWELL.

Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. H. AMBROSE SMITH.

Papers read :—

On the Reduction of Metals. Mr. BRAZIER.

Jan. 9, 1857.

On the Experimental Method in its Application to Physiology. Dr. REDFERN.

Feb. 13.

On the Lusiad of Camoens. Mr. EVANS.

March 13.

On the Cholera in Aberdeen in 1854. Dr. CHRISTIE.

April 3.

On the Character and Civilisation of the Dominant Nations of Antiquity. Mr. W. F. OGG.

June.

On the Ecclesiastical and Baronial Antiquities of the Cathedral of Brechin and Castle of Edzell. Messrs. CLYNE and GRUB.

During the Session the following were elected Members :—

Dec. 12.

George Ogilvie, M.D. (1884.—Now Ogilvie Forbes, Hon. Member, Ex-Professor of Institutes of Medicine, Aberdeen University; Ex-President, Medico-Chirurgical Society.)

James Rettie, Jeweller. (1884.—Ex-President, Mechanics' Institute.)

March 13, 1857.

Wm. Williamson, M.D.

James Steele, M.D.

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April 3.
John Brebner, Master, Grammar School, Aberdeen.
May 8.
Conversazione of the Society in the County Rooms.

June.
Excursion to Castle of Edzell and Cathedral of Brechin.

Nineteenth Session, 1857-1858.

Papers read :—
Nov. 13.
On the Life of Bishop Burnet, and his Character as a Historian and Biographer. Mr. GEORGE GRUB.
On a Curious Variety of Frustrella Hispida, growing at Aberdeen. Dr. REDFERN.

Dec. 11.
The following were elected Office-Bearers :—
President—Dr. REDFERN.
Vice-Presidents—Mr. GRUB and Mr. BOTHWELL.
Secretary—Mr. J. D. MILNE. | *Treasurer*—Mr. H. AMBROSE SMITH.
Papers read :—
On the Physiology of Phrenical Action. Dr. R. JAMIESON.
Jan. 15, 1858.
On the General Plan of Construction traceable in the Higher Divisions of the Animal Kingdom. Dr. GEORGE OGILVIE.
Feb. 12.
On the Character (in Politics and Literature) of the Leading Greek Nationalities. Professor GEDDES.
March 12.
On the Fall of the Knights Templars. Mr. NORVAL CLYNE.
April 1.
On Female Prostitution. Mr. G. B. BOTHWELL.
On Micro-Photography. Mr. H. AMBROSE SMITH.

During the Session the following were elected Members :—
Nov. 13.
Alex. Morrice, Merchant.
Dec. 11.
Alex. D. Milne, Manufacturer. (1884.—Ex-President, Mechanics' Institute ; Ex-Member, School Board.)
Rev. James Greig, Chapel of Garioch.
David Middleton, H.M. Inspector of Schools.

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Jan. 15, 1858.
Rev. James Fraser, St. Clement's.
March 12.
James Hay Chalmers, Advocate.

June.
Excursion to Monymusk and Paradise.

Twentieth Session, 1858-1859.

Nov. 12.
Paper read :—
On Photography, with Special Reference to the Waxed Paper Process. Mr. J. Forbes White.

Dec. 10.
The following were elected Office-Bearers :—

President—Dr. Redfern.
Vice-Presidents—Mr. Grub and Dr. Ogilvie.
Secretary—Mr. J. D. Milne. | *Treasurer*—Mr. H. Ambrose Smith.

Papers read :—
On the Theory of Happiness. Dr. William Fraser.

Jan. 14, 1859.
On the History of Architecture, with Special Reference to the Classic Styles. Mr. James Matthews.
On a New Microscopic Finder. Mr. H. Ambrose Smith.

Feb. 11.
On the Laws of Combustion, as applied to the Economy of Fuel. Mr. A. D. Milne.

By request of the Society this Paper was sent to the *Edinburgh New Philosophical Journal*, and appears in vol. ii., 1860, at pages 45 and 192.

March 11.
On Some of the Changes which take place in the Human Tissues and Organs, in connection with their Nutrition and Action. Professor Redfern.

April 1.
On the Means Provided for the Advancement of Education among the Poorer Classes in the North of Scotland. Mr. William Paul.

During the Session the following were elected Members :—
Nov. 12.
George Cadenhead, Advocate. (1884.—Procurator-Fiscal for the City of Aberdeen.)

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Jan. 14, 1859.
Hardy Robinson, Manufacturer.

March 11.
Rev. George S. Mee, Aberdeen.

April 1.
Rev. Robert Demaus, West-End Academy.

June.
Excursion to Laurencekirk and the Burn.

Twenty-First Session, 1859-1860.

Paper read :—

Nov. 11.
On the Romantic Scottish Ballads, in connection with the recent Pamphlet of Mr. Robert Chambers. Mr. NORVAL CLYNE.

Dec. 9.
The following were elected Office-Bearers :—

President—Mr. J. D. MILNE.
Vice-Presidents—Dr. OGILVIE and Mr. JOHN MILLER.
Secretary—Mr. H. AMBROSE SMITH. | *Treasurer*—Mr. J. D. MILNE.

Papers read :—

On the Musical Scale. Mr. H. AMBROSE SMITH.

Jan. 13, 1860.
On the Great Currents of the Air and Ocean. Mr. JOHN MILLER.

Feb. 10.
On Preternatural Manifestations. Mr. GEO. DAVIDSON.

March 9.
On Spontaneous Generation and the Origin of Parasites.
Professor OGILVIE.

April 5.
On Local School Examinations by the Authorities of the Universities of Oxford and Cambridge. Dr. TEMPLETON.

June 2.
Notes on Kildrummy Castle. Mr. CLYNE.
On the Geological Features of the Neighbourhood.
Mr. CRUICKSHANK.

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During the Session the following were elected Members :—

Dec. 9, 1859.

Wm. Leslie, Architect. (Afterwards Lord Provost of Aberdeen.)
George Carr, M.D.
Wm. Rattray, Teacher.

March 9, 1860.

John Manson, Banker.

June 2.

Excursion to Kildrummy and Alford.

Twenty-Second Session, 1860-1861.

Paper read :—

Nov. 9.

On the Early History of the English Drama. Rev. Mr. DEMAUS.

Dec. 14.

The following were elected Office-Bearers :—

President—Mr. J. D. MILNE.

Vice-Presidents—Dr. OGILVIE and Mr. JOHN MILLER.

Secretary—Mr. H. AMBROSE SMITH. | *Treasurer*—Mr. J. D. MILNE.

Papers read :—

Report of the Meeting of the British Association at Oxford in 1860. Professor OGILVIE and Mr. H. AMBROSE SMITH.

On Electrical Discharges in Rarefied Media, illustrated by means of the variously charged tubes of Mons. Gassiot. Mr. BRAZIER.

Jan. 11, 1861.

On the Progress of Discovery in the Arctic Regions of America. Dr. BEVERIDGE.

Feb. 8.

On the History of Printing and Publication, with Statistics of the Circulation of Periodicals in Aberdeen. Mr. GEO. WALKER.

March 8.

On the Great Currents of the Atmosphere. Mr. JOHN MILLER.

April 5.

A brief Comparison between the Arctic and Antarctic Zones, as regards Climate and Vegetation. Dr. DICKIE.

During the Session the following were elected Members :—

Dec. 14, 1860.

Chas. Frederick Müller, Teacher of Languages.
Wm. Dunn, Advocate.
Rev. James M'Kerrow, B.A.

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Jan. 11, 1861.
Chas. Lyall Grant.
John Willet, C.E.
Feb. 8.
Rev. Robert Gray, Teacher of Mathematics.
Chas. Stewart Gordon, Bank Inspector.
March 8.
Rev. Wm. Barrack, M.A., Rector of Grammar School. (Afterwards LL.D., Rector of Dollar Academy.)
Chas. S. Still (of Burgar), M.D.

June 1.
Excursion to Forest of Glentanar and Mount Keen.

Twenty-Third Session, 1861-1862.

Paper read :—
Nov. 8.
On the Present State and Prospects of Ocean Telegraphy.
Dr. CHARLES S. STILL.
Dec. 13.
The following were elected Office-Bearers :—
President—Dr. DICKIE.
Vice-Presidents—Dr. OGILVIE and Mr. NORVAL CLYNE.
Secretary—Mr. H. AMBROSE SMITH. | *Treasurer*—Mr. J. D. MILNE.
Papers read :—
On the Gold of Australia. Dr. J. SMITH, of Sydney University.
Jan. 10, 1862.
Report of the Meeting of the British Association at Manchester in 1861.
Dr. G. OGILVIE, Dr. J. SMITH, and Mr. HARDY ROBINSON.
Feb. 14.
On the Conflicts between the Civil and Ecclesiastic Powers during the Middle Ages. Mr. C. F. MÜLLER.
March 14.
On Strikes of Workmen. Mr. J. D. MILNE.
April 4.
On the Harmony of the Fine Arts. Rev. Mr. RITCHIE.

During the Session the following were elected Members :—
Nov. 8, 1861.
Alexander M'Farlane, Customs.
John Smith, M.A., Advocate. (1884.—First Permanent President, Society of Advocates, Aberdeen.)

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Dec. 13.
William Williamson, Surgeon-Dentist.
Rev. Nicholas K. M'Leod.
Feb. 14, 1862.
George W. Wilson, Photographer.
April 4.
Thomas Ruxton, Advocate.

June 7.
Excursion to Montrose and Den Fenella.

Twenty-Fourth Session, 1862-1863.

Nov. 14.
Paper read:—
On Dr. James Beattie and his Friends. Mr. George Grub.

Dec. 12.
The following were elected Office-Bearers:—
President—Dr. Dickie.
Vice-Presidents—Dr. Ogilvie and Mr. Norval Clyne.
Secretary—Mr. H. Ambrose Smith. | *Treasurer*—Mr. J. D. Milne.
Papers read—
On the Fable of the Phœnix—its History, Origin, and Signification.
Mr. Williamson.

Jan. 9, 1863.
On Instinct not Transmutable into Reason: an Argument against the Darwinian Theory of Man's Relation to the Ape.
Dr. Harvey.

Feb. 13.
On the Motive Powers and Mechanism of the Living Body.
Dr. George Ogilvie.
On the Binocular Microscope. Mr. H. Ambrose Smith.

March 13.
On Species. Dr. Beveridge.

April 2.
On Literary Puzzles—the Eikon Basilike. Rev. Mr. Demaus.

During the Session the following were elected Members:—
Dec. 12, 1862.
James Clyne, Jun., Leather Merchant.

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Jan. 9, 1863.

James W. Barclay, Merchant. (1884.—M.P. for Forfarshire; Ex-President, Mechanics' Institute.)

John Leask, Registrar.

Feb. 13.

P. L. Gordon, of Craigmyle.

George Reid, Nurseryman.

Mar. 13.

Rev. Wm. Milligan, M.A., D.D., Professor of Divinity and Biblical Criticism, Aberdeen University. (1884.—Chairman, Aberdeen School Board.)

James Milne, Teacher.

Robert Abernethy, C.E. (1884.—Ex-Member, School Board.)

April 2.

Lachlan M'Kinnon, Sen., Advocate.

Lachlan M'Kinnon, Jun., M.A., Advocate.

Wm. Smith, M.A., Architect.

Rev. John Thomson, King Street.

Wm. Jopp, Wine Merchant.

Wm. Forsyth, Editor, *Aberdeen Journal.* (Sometime Member of School Board.)

June 6.

Excursion to the Bullers of Buchan and Slains Castle.

Twenty-Fifth Session, 1863-1864.

Nov. 9.

Paper read :—

On One of our Social Evils. Dr. TEMPLETON.

Dec. 11.

The following were elected Office-Bearers :—

President—Professor BAIN.

Vice-Presidents—Professor BRAZIER and Dr. OGILVIE.

Secretary—Mr. H. AMBROSE SMITH. | *Treasurer*—Mr. J. D. MILNE.

Papers read :—

On the Moral Aspect of Certain Literary Impostures: Ireland's Shakespeare—Surtees' Ballads. Mr. NORVAL CLYNE.

Jan. 8, 1864.

On the Progress made in our Inland Communications since the Middle of Last Century (first part). Mr. JOHN WILLET.

Feb. 12.

On Electrical Discharges through Attenuated Media, with Illustrations by means of Gassiot's Tubes. Professor BRAZIER.

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March 11.

On the Progress made in our Inland Communications since the Middle of Last Century (second part). Mr. JOHN WILLET.

April 1.

On the Physical Accompaniments of Mind (first part). Professor BAIN.

June 28.

On the Antiquities of Dunkeld. Mr. GRUB.

During the Session the following were elected Members :—

Dec. 11, 1863.

James Nicol, Professor of Natural History, Aberdeen University.
John Struthers, M.D., Professor of Anatomy, Aberdeen University.

June 28, 1864.

Excursion to Blairgowrie and Dunkeld.

Twenty-Sixth Session, 1864-1865.

Nov. 18.

Paper read :—

On the Physical Accompaniments of Mind (second part). Professor BAIN.

Dec. 9.

The following were elected Office-Bearers :—

President—Professor BAIN.

Vice-Presidents—Professor BRAZIER and Dr. OGILVIE.

Secretary—Mr. H. AMBROSE SMITH. | *Treasurer*—Mr. A. D. MILNE.

Papers read :—

On Bishop Patrick Forbes and his Friends. Rev. Mr. BARRACK.

Jan. 13, 1865.

On the Spectra of Coloured Flames as applied to Chemical Analysis. Professor BRAZIER.

Notice of an Excavation at the Gas Works, Aberdeen. Professor NICOL.

Feb. 10.

On Froude's History and Mary Queen of Scots. Dr. GRUB.

Feb. 24.

Conversazione of the Society, in the University Buildings. Exhibited—44 Paintings and 80 Engravings and Photographs ; also, Microscopes and Philosophical Apparatus, and Specimens illustrative of Industrial Arts and Ceramic Ware.

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March 10.
On the Physical Accompaniments of Mind (third part).
Professor BAIN.

April 7.
Philological Notes on Lowland Scotch. Professor GEDDES.

June 17.
On Elgin Cathedral. Dr. GRUB.

June 17.
Excursion to Elgin and the Ruins of Pluscarden Priory.

Twenty-Seventh Session, 1865-1866.

Nov. 10.
Paper read :—
On Graham's Experiments on Dialysis—illustrated.
Professor BRAZIER.

Dec. 10.
The following were elected Office-Bearers :—
President—Professor BAIN.
Vice-Presidents—Professor BRAZIER and Dr. BEVERIDGE.
Treasurer and Interim Secretary—Mr. A. D. MILNE.
Papers read :—
On the Statistics of Fever in Aberdeen. Dr. BEVERIDGE.

Jan. 12, 1866.
On Current Views in regard to the Development of Animal and Vegetable Tissues (first part). Professor OGILVIE.

Feb. 9.
On Do. (second part). Professor OGILVIE.
Notes on the Weather of 1865. Rev. A. BEVERLEY.

March 9.
On Rudimentary Structures, especially those found in the Human Body. Dr. STRUTHERS.

April 13.
Exhibition of Microscopical Objects. Professor OGILVIE.
On Some Disputed Points in English Grammar. Professor BAIN.

During the Session the following were elected Members :—
Dec. 10, 1865.
Francis L. Pirie, Manufacturer.
Alex. Rose, Merchant.

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Feb. 9, 1866.

John T. Rennie, Shipowner.

John Ligertwood, Advocate, Sheriff-Clerk.

March 9.

John Black, M.A., Mathematical Examiner, University. (Afterwards Professor of Humanity, University; and Chairman, School Board.)

June 9.

Excursion to Aboyne and Mount Keen.

Twenty-Eighth Session, 1866-1867.

Nov. 9.

Paper read :—

On Society, and its Dependence on Force. Mr. C. F. MÜLLER.

Dec. 14.

The following were elected Office-Bearers :—

President—Professor BAIN.

Vice-Presidents—Professor BRAZIER and Dr. BEVERIDGE.

Secretary and Treasurer—Mr. A. D. MILNE.

Papers read :—

On Some Common Errors on the Mind. Professor BAIN.

Jan 11, 1867.

On the French Element in Lowland Scotch. Professor GEDDES.

Feb. 8.

On the Laws of Health. Dr. BEVERIDGE.

March 8.

On the Anglican Pronunciation of Latin. Mr. N. CLYNE.

On Recent Improvements in the Manufacture and Application of Gun Cotton. Professor BRAZIER.

April 8.

An Outline of the More Remarkable Features of the Propagation, Habits, and Structure of Fishes. Mr. WM. WILLIAMSON.

During the Session the following were elected Members :—

Jan. 11, 1867.

John Comrie Thomson, Sheriff-Substitute of Aberdeen and Kincardine. (1884.—Hon. Member; Sheriff of Ayrshire.)

April 8.

Alex. Ogston, M.A., M.D., C.M., Assistant in University. (1884.—Professor of Surgery, Aberdeen University.)

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June 8.

Excursion to Ballater and Balmoral.

Twenty-Ninth Session, 1867-1868.

Nov. 8.

Paper read :—

On the Retentive Power of the Mind, with reference to Education. Professor BAIN.

Dec. 13.

The following were elected Office-Bearers :—

President—Professor BAIN.

Vice-Presidents—Professor OGILVIE and Dr. KILGOUR.

Secretary and Treasurer—Mr. A. D. MILNE.

Papers read :—

Weather Charts for 1867. Rev. A. BEVERLEY.

Notes on the Boring of an Artesian Well at Sandilands, Aberdeen. Mr. JOHN MILLER.

Jan. 10, 1868.

On Rhyming Latin Verse. Rev. WILLIAM BARRACK.

Feb. 14.

On Proverbs. Sheriff COMRIE THOMSON.

March 13.

Review of the Evidence as to the Complicity of Queen Mary in the Murder of Darnley (first part). Dr. GRUB.

April 3.

Do. (second part). Dr. GRUB.

During the Session the following were elected Members :—

Dec. 13, 1867.

James Cassie, Artist.

William Milne, C.A.

James W. F. Smith, M.D., Lecturer on Clinical Medicine, Royal Infirmary. (1884.—Now Smith-Shand, Professor of Practice of Medicine, Aberdeen University.)

June 6, 1868.

Excursion to Fordoun, Fettercairn, and Cairn o' Month.

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Thirtieth Session, 1868-1869.

Nov. 13.

Paper read :—

On Teaching English. Professor BAIN.

Dec. 11.

The following were elected Office-Bearers :—

President—Professor BAIN.

Vice-Presidents—Professor OGILVIE and Dr. KILGOUR.

Secretary and Treasurer—Mr. A. D. MILNE.

Papers read :—

On the Mechanism of the Senses. Professor OGILVIE.

Jan. 8, 1869.

On Recent Researches on the Physiology of the Eye, with special reference to Colours and Colour Blindness. Dr. BEVERIDGE.

Feb. 12.

Weather Charts for 1868, with Notes. Rev. A. BEVERLEY.

On the Variations of Rainfall, with Notes on Evaporation, Percolation, &c. (first part). Mr. JOHN WILLET.

March 12.

On the Variations of Rainfall, &c. (second part). Mr. JOHN WILLET.

On Celestial Photography—illustrated. Mr. D. GILL, Jun.

April 2.

Exhibition of Objects—Scientific, Antiquarian, &c. VARIOUS MEMBERS.

During the Session the following were elected Members :—

Nov. 13, 1868.

Angus Fraser, M.A., M.D. (1884.—Lecturer on Clinical Medicine, Royal Infirmary.)

Dec. 11.

David Gill, Jun. (1884.—LL.D., Hon. Member ; Astronomer Royal, Cape of Good Hope.)

Alex. Yeats, M.A., Advocate. (1884.—Town-Clerk Depute.)

June 12, 1869.

Excursion to Braes o' Gight and Ellon.

Thirty-First Session, 1869-1870.

Nov. 2.

Paper read :—

On the Latin, Celtic, and Norse Elements in Lowland Scotch. Professor GEDDES.

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Dec. 7.

The following were elected Office-Bearers :—

President—Professor OGILVIE.
Vice-Presidents—Professor BAIN and Professor NICOL.
Secretary and Treasurer—Mr. A. D. MILNE.

Papers read :—

On Spectrum Analysis in Astronomy. Mr. D. GILL, Jun.

Jan. 4, 1870.

Exhibition of Objects—Scientific, &c. VARIOUS MEMBERS.

Experiments—Electric Light and Spectroscope. Mr. D. GILL, Jun.

Feb. 1.

On the Perception of the Direction of Sound. Dr. ALEX. OGSTON.

On the Mechanism of Sensation. Professor OGILVIE.

March 1.

On the Present State of the Question of Spontaneous Generation. Professor OGILVIE.

April 5.

Weather Charts for 1869. Rev. A. BEVERLEY.

Description of a Model showing the Structure of the Bird. Professor NICOL.

During the Session the following were elected Members :—

Dec. 7, 1869.

Andrew Inglis, M.D., Professor of Midwifery, Aberdeen University.

James Rodger, M.A., M.B., C.M., Assistant Professor of Anatomy, Aberdeen University. (1884.—M.D., Lecturer on Pathology, Royal Infirmary.)

Alex. Dyce Davidson, M.A., M.B., M.R.C.S.E., Assistant, Materia Medica, Aberdeen University. (1884. — M.D., Professor of Materia Medica, Aberdeen University ; Ophthalmic Surgeon, Royal Infirmary.)

June 4, 1870.

Excursion to Dunecht House, Midmar Castle, and Banchory.

Thirty-Second Session, 1870-1871.

Nov. 1.

Paper read :—

On Freemasonry. Dr. BEVERIDGE.

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Dec. 6.

The following were elected Office-Bearers :—

President—Professor OGILVIE.

Vice-Presidents—Professor BAIN and Professor NICOL.

Secretary and Treasurer—Mr. A. D. MILNE.

Papers read :—

On Fire and its Theology. Mr. WM. WILLIAMSON.

Jan. 3, 1871.

On the Early History of Christianity in Buchan. Professor OGILVIE.

Exhibition of Objects—Scientific, Artistic, &c. VARIOUS MEMBERS.

Feb. 7.

On Spectrum Analysis in Astronomy. Mr. D. GILL, Jun.

March 7.

On some Leading Principles in Education. Professor BAIN.

April 4.

Account of a Recent Visit to two Sewage Irrigation Farms near London. Mr. JOHN MILLER.

On the Necessity for the Utilization of the Manurial Refuse of Large Towns. Mr. J. W. BARCLAY.

June 9.

On Arbroath Abbey and the adjacent Coast. Mr. A. CRUICKSHANK.

During the Session the following were elected Members :—

Nov. 1, 1870.

(*Hon.*) Lord Lindsay. (1884.—Now Earl of Crawford and Balcarres.)

Dec. 6.

Rev. Henry Jones, St. Mary's, Carden Place.

Wm. Yeats, M.A., Advocate.

June 9, 1871.

Excursion to Arbroath.

Thirty-Third Session, 1871-1872.

Nov. 7.

Papers read :—

On the Scientific and Literary Work of the Society since its commencement. Professor OGILVIE.

On the Present Position of the Society and of kindred Societies (first part). Mr. ALEX. D. MILNE.

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Dec. 5.

The following were elected Office-Bearers :—

President—Professor GEDDES.

Vice-Presidents—Professor BAIN and Professor OGILVIE.

Secretary and Treasurer—Mr. A. D. MILNE.

Papers read :—

On the Present Position of the Society and of kindred Societies (second part). Mr. ALEX. D. MILNE.

Jan. 9, 1872.

On Grimm's Law of Displacement. Professor GEDDES.

Feb. 6.

On the Whales Stranded on the Aberdeenshire Coast during the past year, with Exhibition of Specimens of their Anatomical Structure. Professor STRUTHERS.

March 5.

On Spectrum Analysis—Nebulæ and Comets. Mr. D. GILL, Jun.

April 2.

On Coal—its Origin and Structure, &c., illustrated by Specimens, Diagrams, and Microscopical Preparations. Dr. DICKIE.

The following were elected Members of Council, in addition to the other Office-Bearers :—

Professor BRAZIER, Mr. JOHN MILLER, and Mr. D. GILL, Jun.

During the Session the following were elected Members :—

Dec. 5, 1871.

Rev. Henry Cowan, B.D., West Parish.

David Shier, M.D.

David Fiddes, M.D. (Sometime President of Medico-Chirurgical Society.)

Thirty-Fourth Session, 1872-1873.

Nov. 12.

Paper read :—

On Local Aspects of the Fine Arts (first part). Professor GEDDES.

Dec. 3.

The following were elected Office-Bearers :—

President—Professor GEDDES.

Vice-Presidents—Professor BAIN and Professor OGILVIE.

Secretary and Treasurer—Mr. A. D. MILNE.

Council—Professor BRAZIER, Mr. JOHN MILLER, and Mr. D. GILL, Jun.

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Jan. 6, 1873.

Papers read :—

Lecture on the Natural History of Coal. Professor NICOL.

Feb. 3.

On the Sun's Distance, specially with reference to its Determination at the approaching Transit of Venus in 1874.
Mr. D. GILL, Jun.

March 4.

On the Hypothesis of Evolution as applied to the Mind.
Professor BAIN.

Lecture on the Chemistry of Coal. Professor BRAZIER.

April 1.

On a Principal Feature in Tennyson's Poetry. Mr. N. CLYNE.

During the Session the following were elected Members :—

Dec. 3, 1872.

Rev. W. Robertson Smith, M.A., Professor of Hebrew, F.C. College. (1884.—LL.D., F.R.S.E., Hon. Member; Professor of Arabic, Cambridge University; ex-Member, Aberdeen School Board.)

Rev. John S. Falconer, St. John's Church.

Feb. 3, 1873.

Robert Urquhart, Merchant. (Afterwards President, Mechanics' Institute.)

Patrick H. Chalmers, M.A., Advocate. (1884.—F.S.A., Scot.)

March 4.

Rev. Andrew Martin Fairbairn. (1884.—LL.D., Hon. Member; Principal of Airedale College.)

June.

Excursion to Craigievar Castle.

Thirty-Fifth Session, 1873-1874.

Nov. 11.

Paper read :—

On Local Aspects of the Fine Arts (second part), being Notes on Architecture in Old Aberdeen. Professor GEDDES.

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Dec. 2.

The following were elected Office-Bearers :—

President—Mr. NORVAL CLYNE.

Vice-Presidents—Sheriff THOMSON and Professor OGILVIE.

Secretary and Treasurer—Mr. A. D. MILNE.

Council—Mr. JOHN MILLER, Mr. ALEX. CRUICKSHANK, and Dr. BEVERIDGE.

Papers read :—

On the Recent Arctic Expedition. Dr. BEVERIDGE.

Jan. 13, 1874.

On the Astronomical Determination of Time, and the Methods of its Public Distribution. Mr. D. GILL, Jun.

Feb. 3.

On the Present Aspect of the Sewage Question (first part). Mr. JOHN WILLET.

Feb. 23.

Do. do. (second part). Mr. JOHN WILLET.

March 3.

On a Recent Contribution to the Psychological Theory of Space, with special reference to the Doctrine of Professor Bain. Professor W. R. SMITH.

During the Session the following were elected Members :—

Dec. 2, 1873.

Harvey Hall, Advocate, C.A.

William Alexander, Editor, *Free Press.*

Jan. 13, 1874.

John Dove Wilson, Sheriff-Substitute for Aberdeen and Kincardine. (1884.—LL.D.)

March 3.

John O. Macqueen, S.S.C.

April 3.

Alex. Smith, Manager, Gas Works.

Thirty-Sixth Session, 1874-1875.

Nov. 3.

Paper read :—

On some Scottish Historical Ballads. Mr. N. CLYNE.

Dec. 1.

The following were elected Office-Bearers :—

President——Mr. NORVAL CLYNE.

Vice-Presidents—Sheriff THOMSON and Professor OGILVIE.

Secretary and Treasurer—Mr. A. D. MILNE.

Council—Mr. JOHN MILLER, Mr. ALEX. CRUICKSHANK, and Dr. BEVERIDGE.

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Papers read :—

On Modern Civilization—its Indo-European and Semitic Sources (first paper). Rev. A. M. FAIRBAIRN.

Jan. 19, 1875.

Memoir of Dr. Neil Arnott, with special reference to His Education and Life in Aberdeen from 1796 to 1806. Professor BAIN.

Feb. 2.

On the History of the Sheriff Courts. Sheriff DOVE WILSON.

March 2.

On the Place of the Indo-European and Semitic Races in the History of Mind (second paper). Rev. A. M. FAIRBAIRN.

April 6.

On Arctic Explorations. Dr. BEVERIDGE.

During the Session the following were elected Members :—

Dec. 1, 1874.

Lessel Stephen, Advocate.
Thos. A. W. A. Youngson, M.A., Advocate.

Jan. 5, 1875.

Jas. Paterson, Merchant.
John Keith, Banker.

Feb. 2.

Alex. Simpson, Jun., Procurator-Fiscal.
Rev. James Wiseman, M.A., Buxburn.

March 2.

Francis Ogston, Jun., M.D.

April 6.

Archd. M. M'Donald, Advocate.
J. P. Cumine, M.A., Advocate.

Thirty-Seventh Session, 1875-1876.

Nov. 2.

Paper read :—

Account of an Expedition to Mauritius to observe the Transit of Venus. Mr. D. GILL, Jun.

Dec. 6.

The following were elected Office-Bearers :—

President—Dr. BEVERIDGE.
Vice-Presidents—Sheriff THOMSON and Mr. JOHN MILLER.
Secretary and Treasurer—Mr. A. D. MILNE.
Council—Professor BAIN, Mr. J. WILLET, and Dr. OGILVIE.

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Papers read :—

On the Early Life of James Mill in Scotland. Professor BAIN.

Jan. 11, 1876.

On the Territorial History of the Burgh of Aberdeen.
Mr. GEO. CADENHEAD.

Feb. 11.

On the Question of Spontaneous Generation. Dr. BEVERIDGE.

March 7.

On Just Intonation in Song and Speech. Mr. JAS. WALKER.

April 4.

Is the Existence of Purely Spiritual Beings Demonstrable?
Rev. JAS. WISEMAN.

During the Session the following were elected Members :—

Dec. 6, 1875.

J. Russell Mackenzie, Architect.

Jan. 17, 1876.

Alex. S. Cook, Merchant.

Feb. 11.

Arthur D. Morice, M.A., F.S.A., Scot., Advocate.

March 7.

Alex. M. Ogston, Manufacturer.
Robert B. Horne, Sharebroker.
Rev. Jas. A. M'Clymont, B.D., Holburn Parish.

April 4.

Jas. Duguid, M.A., Advocate.
Farquharson T. Garden, Advocate.

June 10.

Excursion to Fordoun and Fettercairn.

Thirty-Eighth Session, 1876-1877.

Nov. 7.

Paper read :—

On Scientific Progress during the Past Year. Dr. BEVERIDGE.

Dec. 13.

The following were elected Office-Bearers :—

President—Dr. BEVERIDGE.
Vice-Presidents—Sheriff THOMSON and Mr. JOHN MILLER.
Secretary and Treasurer—Mr. A. D. MILNE.
Council—Professor BAIN, Mr. J. WILLET,
and Dr. OGILVIE.

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Papers read :—

On Difficulties connected with the Administration of the Statutes regulating Reformatories and Industrial Schools.
Sheriff COMRIE THOMSON.

Jan. 2, 1877.

On the use of Atmospheric Air as the Motive Agent in Carriage Propulsion and Town Drainage. Mr. ALEX. D. MILNE.

Feb. 6.

On the Analogy between the Nervous System and the Electric Telegraph. Dr. WILLIAM FRASER.

Description and Model of Bazin's Pneumatic Dredger.
Mr. ALEX. D. MILNE.

Feb. 20.

On the Bayeux Tapestry. (By request.) Miss ELLA BURTON.

March 21.

On Social Life in the North-East of Scotland a Century ago (first part). Mr. WILLIAM ALEXANDER.

April 3.

Do. do. (second part). Mr. WILLIAM ALEXANDER.

During the Session the following were elected Members :—

Jan. 2, 1877.

G. L. Merriman.

Jas. M. Garden, M.A., Advocate. (1884.—Member, School Board.)

Jan. 22.

Alex. Walker, F.S.A., Scot., Wine Merchant. (1884.—Ex-Member, School Board.)

John Morgan, Builder.

John Ligertwood, M.A., M.D., Methlic.

Feb. 6.

Jas. Tytler, C.A., Sharebroker.

Feb. 20.

Wm. Boulton, C.E., Town Surveyor.

Patrick Cooper, Advocate.

Wm. Stephenson, M.D., F.R.C.S.E., Professor of Midwifery, Aberdeen University.

Rev. Stewart D. F. Salmond, M.A., D.D., Professor of Exegetical Theology, Free Church College. (1884.—Member, School Board.)

Thirty-Ninth Session, 1877-1878.

Nov. 13.

Paper read :—

On Recent Investigations into the Physiology of the Nervous System. Dr. BEVERIDGE.

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Dec. 4.

The following were elected Office-Bearers :—

President—Dr. BEVERIDGE.

Vice-Presidents—Sheriff THOMSON and Mr. JOHN MILLER.

Secretary and Treasurer—Mr. A. D. MILNE.

Council—Mr. J. WILLET, Professor BAIN, and Mr. ALEX. CRUICKSHANK.

Papers read :—

On Hydraulic and Pneumatic Agencies for the Transmission of Motive Power. Mr. JOHN WILLET.

Jan. 15, 1878.

On Professor Graham Bell's Telephone. Mr. ALEX. D. MILNE.

Feb. 5.

On the Sequence of Subjects in Teaching (first part). Professor BAIN.

March 5.

Do. do. (second part). Professor BAIN.

April 9.

On the Characteristics of Robert Browning. Professor GEDDES.

April 26.

Exhibition of Carbonic Acid in the form of Visible Vapour. Professor BRAZIER.

During the Session the following were elected Members :—

March 5, 1878.

Geo. L. Rorie, Banker.

Geo. P. Macdonell, M.A., Teacher.

John Kerr, Government Inspector of Schools.

June 8.

Excursion to Dunecht and Banchory.

Fortieth Session, 1878-1879.

Nov. 15.

Address :—

On "Fiji." Hon. Sir ARTHUR H. GORDON, K.C.M.G.

Dec. 3.

The following were elected Office-Bearers :—

President—Sheriff THOMSON.

Vice-Presidents—Dr. BEVERIDGE and Mr. JOHN MILLER.

Secretary and Treasurer—Mr. A. D. MILNE.

Council—Mr. JOHN WILLET, Mr. ALEX. CRUICKSHANK, and Mr. WILLIAM ALEXANDER.

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Papers read :—

Notes on the Scotch Legislation of the Past Year.
Sheriff COMRIE THOMSON.

Jan. 7, 1879.

On Professor Ruskin and his Society of St. George.
Mr. JOHN MORGAN.

Jan. 31.

On the Element of Beauty in Music, as related to, and manifested in, the Fine Arts, with Illustrations. Mr. JAMES WALKER.

Feb. 18.

On the Disposal of Town Sewage. Mr. JOHN MILLER.

March 4.

Memoir of the late Dr. Thomas Clark, of Marischal College.
Professor BAIN.

April 8.

On Rousseau, with special reference to the "Emile."
Mr. GEORGE P. MACDONELL.

During the Session the following were elected Members :—

Nov. 15, 1878.

Wm. Stirling, M.D., D.Sc., F.R.S.E., Professor of Institutes of Medicine, Aberdeen University.

(*Hon.*) The Hon. Sir Arthur H. Gordon, K.C.M.G.

Dec. 3.

Major John Ross, Chief Constable of Aberdeenshire. (1884.—Ex-Member, School Board.)

Geo. Miller, Manufacturing Chemist.

Feb. 18, 1879.

Thos. Jamieson, F.I.C., F.C.S., City Analyst. (1884.—Lecturer on Agriculture, Aberdeen University.)

March 4.

Arthur Clyne, Architect.

Alex. Copland, Merchant.

David McHardy, Jun., Manufacturer.

April 8.

Geo. Jamieson, F.S.A., Scot., Merchant, Lord Provost. (1884.—Member, School Board.

June 21.

Excursion to St. Andrews.

Forty-First Session, 1879-1880.

Nov. 11.

Paper read :—

On Professor Nordenskiold and the North-East Passage.
Dr. BEVERIDGE.

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Dec. 16.

The following were elected Office-Bearers :—

President—Sheriff THOMSON.

Vice-Presidents—Dr. BEVERIDGE and Mr. JOHN MILLER.

Secretary and Treasurer—Mr. A. D. MILNE.

Council—Mr. JOHN WILLET, Mr. ALEX. CRUICKSHANK, and Mr. WILLIAM ALEXANDER.

Papers read :—

Remarks as to a larger Supply of Papers and Communications. The SECRETARY.

Jan. 6, 1880.

On the Grounds of some Political Opinions. (Read by Sheriff THOMSON.) Mr. GEORGE P. MACDONELL.

Feb. 3.

On Rudimentary Structures found in the Greenland Whale, with comparison to Structures in the Human Body. Professor STRUTHERS.

March 9.

On European Agriculture, illustrated. Mr. THOMAS JAMIESON.

April 6.

On the Churches of St. Nicolas, Aberdeen. Mr. JAMES RETTIE.

During the Session the following were elected Members :—

Nov. 11, 1879.

J. Cossar-Ewart, M.D., F.R.C.S.E., F.R.S.E., Professor of Natural History, Aberdeen University. (1884.—Professor of Natural History, Edinburgh University.)

Dec. 16.

Alex. Collie, M.D., Homerton Fever Hospital, London.

Jan. 6, 1880.

Peter Esslemont, Merchant. (1884.—Ex-Member, School Board; Ex-Lord Provost.)

David Littlejohn, Advocate.

David W. Abernethy, Engineer.

Feb. 3.

Alex. Rainage, Rector, Free Church Training College.

June 11.

Excursion to Loch Kinord.

Forty-Second Session, 1880-1881.

Nov. 9.

Paper read :—

On the Proper Form of Shoe, considered in relation to the Anatomy of the Foot. Professor STRUTHERS.

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Dec. 7.

The following were elected Office-Bearers :—

President—Professor STRUTHERS.
Vice-Presidents—Sheriff THOMSON and Dr. BEVERIDGE.
Secretary and Treasurer—Mr. A. D. MILNE.
Council—Professor BAIN, Mr. JOHN MILLER, and Mr. ALEX. CRUICKSHANK.

Papers read :—

Biography of Dr. John Shier. Dr. BAIN.

Jan. 11, 1881.

On the Evolution of Limbs. Professor EWART.

Feb. 1.

On the Recent Increase in Pauper Lunacy. Dr. WILLIAM FRASER.

March 8.

On the Origin of the Arch, and the Distinctive Characteristics of English Mediæval Architecture. Mr. JAMES MATTHEWS.

April 12.

Local Antiquarian Notes. Mr. JAMES RETTIE.

During the Session the following were elected Members :—

Jan. 11, 1881.

Rev. Robert Lippe, Chaplain, Royal Infirmary.
F. Maitland Moir, M.B.
Alex. Forbes, Merchant.
Jos. Ogilvie, M.A., Rector, Church of Scotland Training College.

Feb. 1.

John G. Hall, M.D., Assistant to Professor of Materia Medica, University; Junior Surgeon, Royal Infirmary.
Jos. R. Cornwall, Lithographer.

March 8.

Wm. Minto, M.A., Professor of Logic, Aberdeen University.
Wm. Smith, Harbour Engineer.
Jas. M'Cormack, Superintendent of Postal Telegraphs, Aberdeen.

April 12.

Rev. Geo. Pirie, M.A., Professor of Mathematics, Aberdeen University.
Alex. M. Mackenzie, Architect.
Archd. Gillies, Manager, *Aberdeen Journal*.
Thos. Skene, Inspector of Poor.
James D. Matthews.

June 4.

Excursion to Banchory, Finzean, and Aboyne.

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Forty-Third Session, 1881-1882.

Nov. 8.

Papers read :—

Memoir of Dr. Neil Arnott (second part). Professor BAIN.

Dec. 20.

On Bacteria—the Ferment Organisms that cause Disease.
Dr. ALEX. OGSTON.

Jan. 10, 1882.

The following were elected Office-Bearers :—

President—Professor STRUTHERS.
Vice-Presidents—Sheriff THOMSON and Dr. BEVERIDGE.
Secretary and Treasurer—Mr. A. D. MILNE.
Council—Professor BAIN, Mr. JOHN MILLER, and Mr. ALEX. CRUICKSHANK.

Papers read :—

On a Theory of Sea Works, illustrated (first part).
Mr. WM. SMITH, Harbour Engineer.

March 7.

On Neuro-Polarity. Dr. WM. FRASER.

April 4.

Is Free Trade Sound Policy for Great Britain?
Mr. ALEX. FORBES.

April 25.

On the Health History of Aberdeen during the last Twenty-five Years. Dr. SIMPSON.

During the Session the following were elected Members :—

Jan. 10, 1882.

David Stewart, Manufacturer.
James Forbes, Merchant.
William Lindsay, Publisher.

March 7.

Wm. J. Simpson, M.D., C.S.Sc., Camb. Univ.; Medical Officer of Health; Lecturer on Public Health, Aberdeen University.
Gustav Hein, Teacher of Modern Languages.

April 4.

David Sinclair of Altens.
Oswald Prosser, Solicitor. (1884.—Member, School Board.)

April 25.

Rev. Jas. M. Danson, M.A., St. Andrew's Episcopal Church. (1884.—Ex-Member, School Board.)
Jas. Moir, M.A., Rector, Grammar School.
Chas. A. Mollyson, North of Scotland Bank.

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June 24.

Excursion to Newburgh and Slains.

Forty-Fourth Session, 1882-1883.

Nov. 7.

Paper read :—

On a Theory of Sea Works (second part).

Mr. Wm. Smith, Harbour Engineer.

Dec. 12.

The following were elected Office-Bearers :—

President—Sheriff Dove Wilson.

Vice-Presidents—Professor Struthers and Dr. Bain.

Secretary and Treasurer—Mr. A. D. Milne.

Council—Mr. John Miller, Dr. Alex. Cruickshank, and Dr. Beveridge.

Papers read :—

On the Catacombs of Rome, and their Historic Testimony; illustrated by De Rossi's Plates and Roller's Photographs.

Rev. Professor Salmond.

Jan. 12, 1883.

The Comet of 1882. (Read by Mr. Roy.) Mr. David Gill.

Cunningham's System of Ventilation, illustrated.

Mr. John Miller.

Feb. 6.

On the Deviation of the Compasses on Iron Ships.

Professor George Pirie.

March 6.

On the Scientific Value of Lowland Scotch.

Mr. James Moir.

March 20.

On the Success of Free Public Libraries in Industrial Towns, and the Necessity for a Free Public Library in Aberdeen.

Mr. J. D. Milne.

April 3.

Some Notes on Modern Russia—its Policy, Culture, and Literature.

Herr Gustav Hein.

During the Session the following were elected Members :—

Dec. 12, 1882.

Jas. P. Kay, Chemist.

Wm. C. Fyfe, Scottish Provincial Assurance Company.

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Jan. 9, 1883.

Edward W. Robertson, M.D., Royal Infirmary.

Rev. Geo. T. Walters.

Feb. 6.

John Roy, Teacher.

Wm. H. Williamson, M.D., D.D.S., L.D.S., Dental Surgeon, Royal Infirmary.

March 6.

Geo. G. Jenkins, C.E.

Wm. L. Henderson, M.A., Architect.

Alex. Adam, C.E.

March 20.

Alex. M. Williams, M.A., Teacher.

April 3.

John Seivwright, Merchant.

Rev, Chas. M. Black. St. James' Episcopal Church.

Robt. J. Garden, M.D., C.M.

John Parker, Advocate.

July 7.

Excursion to the Den o' Airlie.

Forty-Fifth Session, 1883-1884.

Nov. 13, 1883.

Paper read :—

On the Working of the Artizans' Dwellings Acts.

Dr. BEVERIDGE.

Dec. 11.

The following were elected Office-Bearers :—

President—Sheriff DOVE WILSON.

Vice-Presidents—Professor STRUTHERS and Dr. BAIN.

Secretary and Treasurer—Mr. A. D. MILNE.

Council—Mr. JOHN MILLER, Dr. ALEX. CRUICKSHANK, and Dr. BEVERIDGE.

Papers read :—

On some of the First Books Printed in English.

Professor MINTO.

Jan. 8, 1884.

On the Art of Study. Dr. BAIN.

Feb. 5.

On Electricity and its Present Applications. Dr. WM. FRASER.

Feb. 19.

On a Recent Visit to Egypt. Dr. SIMPSON.

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March 4.

On the Influence of our Educational System on the Health of Children. Professor STEPHENSON.

April 8.

On the History and Public Work of the Society.

Mr. ALEX. D. MILNE.

During the Session the following were elected Members:—

Dec. 11, 1883.

John William Crombie, Manufacturer.
Theodore Crombie, Manufacturer.
John B. Pirie, Architect.
F. Grant Ogilvie, M.A., B.Sc., Gordon's College.
David Walker, Bookseller.
John C. O. Will, M.D., F.R.S.E.

Jan. 8, 1884.

Colonel J. Allardyce.
Ranald Macdonald, Factor for the Cluny Estates.
Rev. Arthur F. S. Hill, M.A., St. Mary's Episcopal Church.

Feb. 5.

Alex. Mackie, M.A., Teacher.
Rev. Wm. H. Bleaden, St. John's Episcopal Church.
Wm. C. Good, Manufacturer.
Wm. Mackay, Chemist.
James Minty, Inspector of Cleansing.
Hugh F. Campbell, M.A., Teacher.

Feb. 19.

Rev. Geo. A. Smith, M.A., Queen's Cross Free Church.
Alexander Kemlo, Advocate.
Rev. William T. Ker.
Rev. Henry W. Wright, Ferryhill Parish.

March 4.

John Findlater, Banker.
Hugh Mackenzie, Teller, North of Scotland Bank.
John Wight, M.D., C.M.
Robert Smith, Joint Agent, Bank of Scotland.

April 8.

John D. Anderson, M.A., Teacher.
Jas. M'Kenzie Booth, M.A., M.B., C.M.
Jas. Davidson, Manager, Accident Insurance Co.
Alex. Forbes, Teacher.
P. J. Anderson, M.A., LL.B., Teacher.

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SELECTION OF PAPERS

READ BEFORE THE ABERDEEN PHILOSOPHICAL SOCIETY SINCE 1872.

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November 12, 1872.—PROFESSOR OGILVIE, *Vice-President, in the Chair.*

PROFESSOR GEDDES read a paper, "On Local Aspects of the Fine Arts."

Local Aspects of the Fine Arts. By PROFESSOR GEDDES.

I. ABERDEEN.

THE following paper has for its object to present a view of the more interesting and important facts relating to Art in Aberdeen.

The subject is one that has proved more fruitful and suggestive than the common impression regarding our city would seem to imply. To inquire as to the Fine Arts upon our granite soil would, to many in the south, appear a not very hopeful quest, for we are supposed to dwell in the land of the rain, in "a northern city cold," and are believed to be a people more remarkable for intellectual than æsthetic qualities. How far this is the case may appear from the subsequent review,* which will adduce some facts that call, if not for reversal, at least for arrest of judgment, and point, with all our deficiencies, to a considerably modified conclusion.

The Fine Arts may be roughly enumerated as Music, addressing itself primarily to the Ear; and the three arts of Design, viz., Painting, Sculpture, and Architecture, addressing themselves, in their respective materials, primarily to the Eye. These manifest themselves in concrete products of a more or less permanent character, and these products may admit of classification and comparison, so that a judgment may be formed on certain canons regarding them, under historical conditions of Time and Place. Other forms of the Fine Arts must be left outside the scope of such enquiry at present, either as too lofty and spiritual, addressing themselves directly to the soul, such as Poetry and Rhetoric; or mainly corporeal and evanescent, such as the art of orchestic or Dancing; and are therefore either above or below our line of vision at present as historical phenomena. Accordingly these are passed by, although something might be said about what Aberdeen has done even in

* In this survey, I have not thought myself justified in referring, except by the barest allusion, to the works of *living* artists. Another generation will have ample materials inherited from the present for a more extended criticism.

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these departments, which is at least worth looking to; in Rhetoric, the philosophical exposition of its principles by George Campbell, a work unmatched since Aristotle's great treatise on that subject; and in Poetry, what we know—I refer to such names as Barbour and Arthur Jonston in the old time, in the newer time to Beattie, and two whom we may perhaps claim distantly as semi-Aberdonians, Byron and George MacDonald. And even in the fine art of Rhythmic movement, we are not without something to show. There exists, what may not be generally known, a systematic treatise on Dancing by Peacock, an Aberdeen man,* who has the boldness to treat of that art from the earliest times, from King David downwards, and whose name survives in "Peacock's Close" to this day.

Turning therefore to the other artistic manifestations, what has Aberdeen historically to show? In Music, it is noteworthy that a *Sang-Scule* figured among the institutions of the city as early as 1475, and the old ideal for which Plato contended of having μουσική alongside of γραμματική, was probably as well if not better acted up to in those ancient days in Aberdeen than in most other places; for the *Sang-Scule* as well as the "Grammar Scule" frequently recurs in old records as under the special guardianship of the city. It is a misfortune that the *Sang-Scule* was allowed to perish,† and a humanising influence of a most salutary kind has thus been lost or ignored, for the want of which our youth incurs grave censure because of roughness and rudeness, the natural result of such deprivation. If there were an hour's teaching a-week of sweet music in the schools of Aberdeen, we should ere long witness a vast improvement in the tastes and enjoyments of the juvenile population, and we should be less pained than we are by unæsthetic things perpetrated by boys, such as the decapitating of railings and other hideous things too patent to the eye in most streets and squares.

But although we have no *sang-scule* now, we have the interesting literary relic of it in what is no doubt a fruit of it, "Forbes's Cantus,"‡ a collection of tunes published in 1662, which passed

* On ancient music in Aberdeen, see interesting notices in "Collections (p. 57 Spalding Club) on the Shires of Aberdeen and Banff."

† Since this was composed, the "Sang Scule" has been revived under excellent, though private, auspices. We hope it may grow and prosper and perhaps develope into a "Chair of Music" attached to the University.

‡ This is the earliest musical work of the Scottish press in which secular songs were given with musical notation, and therefore *the oldest secular music of our country first came into form in Aberdeen.* Another proof of the influence of its musical culture is the fact that it was in our city that the old practice of giving out the line in Psalm-singing was first discontinued, and the example

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through three editions in that century. One other fact in connection with this head occurs as worthy of note, that the recent revival of Psalmody over Scotland, as witnessed by such works as the "People's Tune Book" and the "Northern Psalter," has received not a little of its best impulse from Aberdeen.

In reviewing our relation to the other Arts, I shall take them in order according to their power of Expression, that being also the order of their perishableness—Painting, in which expression is at maximum and material at minimum, Sculpture, in which expression and material are equalised, and Architecture, in which expression is least and material most. In the first of these, or the department of Painting, the position of Aberdeen is relatively strong. It is something to be able to produce a roll of artists, not indeed continuous or unbroken, yet still noteworthy, to which indeed there is nothing equal in the history of any other Scottish city, except Edinburgh, and in some respects surpassing what even the modern Athens in her own right can show. That roll begins with Jamesone, contains the names of Giles and Dyce, and may for present purposes end with John Philip, several of these being, each in his time, *princeps*, if not *facile princeps*, in his peculiar walk. The first of these has especial claims to remembrance in any survey of Art in Aberdeen. At a time when Art was nowhere in the rest of Scotland, and nowhere in all England, when the English cavaliers have to import Vandyck to paint their portraits, our northern nobles and gentry find a native Vandyck at home in the person of George Jamesone,* "citizen of Aberdeen." It is true he had learned in the School of Rubens, and was a fellow pupil of Vandyck at Antwerp, but that is no detraction from his merit, rather enhances it, that he went at once to the fountain head of Art open in his own day. Not till Reynolds appeared was there a name in England comparable to that of Jamesone in the Pictorial Art. In our own time the position of Aberdeen is well sustained by more than one artist, in landscape as well as in the Jamesone walk of portrait, of whom our city will have cause to be proud—*Qui olim memorabuntur.*

Under this head, though not of native production, yet of native

spread *afterwards* to Edinburgh and the rest of Scotland. In last century the taste for music expressed itself in the Beattie period by a famous Musical Society which showed considerable appreciation of the higher or Italian music, and the fame of it still survives.

* Authorities as to Jamesone will be found in "Collections for Shires of Aberdeen and Banff," p. 55 (Spalding Clnb).

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possession, may be mentioned as perhaps the most interesting single work of art in Aberdeen, and among the greatest pictures in Scotland—Reynolds' portrait of Beattie. It belongs to the representatives of the "Minstrel," a family long connected with the University, who have the felicity of possessing a splendid specimen of the Master. The figure of Truth in this picture is unmatched in ideal beauty since Raphael. It would be little short of a calamity, if this great picture were ever from any cause to be removed from its proper home, in the city where the Minstrel lived and died.

In the department of Sculpture we have less to point to, and much of that can scarcely be called native, but has been imported. A few marble monuments in churches, the Flaxman group in the front of Gordon's Hospital, the renaissance tomb of Bishop Scougal in the Cathedral, are the bulk of what we have, besides the few statues* on the line of Union Street; not much to boast of altogether, but what British city has, for its population, relatively more? We are not worse off than our neighbours, or indeed than all modern races, for, apart from the Italian Sculpture in the time of the Republics,† and apart from the noble sculpture of some of the cities of modern Germany, where, we may ask, is the sculpture of modern times? Take away the names of Giovanni di Bologna, Cellini, Michael Angelo, and a few others, we have only in what remains imitations, more or less successful, of the ancient Greek.‡ Canova himself is strong only in measure as he wrought in, or approached to, that ancient vein, and the exhibitions at our Royal Academies are in general annual exhibitions of our poverty in conception and feebleness in execution as to the plastic art. It may be doubtful if our island can produce more than one name comparable in this regard to what three Teutonic towns can show; Copenhagen in her Thorwaldsen, Leipzig in her Rietschel, and Munich in her

* The so-called Wallace Statue looks like the *effigies* of a once recumbent Knight taken from an altar tomb and raised to the perpendicular.—The curious old figure on the Fountain in the Green (which Fountain once stood in Castle Street), is worth noting as a curious illustration of Mr. Ruskin's interesting assertion that Hydraulics and Sculpture have often gone together. Speaking of the artistic relations of water he observes—"In the hot square of the city where you set it free, you find it good for health and pleasantness to let it leap into a fountain. On these several needs you have a School of Sculpture founded, in the decoration of the walls of wells in level countries and of the sources of springs in mountainous ones, and chiefly of all *where the women of household or market meet at the fountain.*"—Ruskin's Lectures on Art (p. 109.)

† Republics, as in medieval Italy and ancient Greece, would seem to be favourable to the Plastic art.

‡ "I tell thee, never admire the work of a modern sculptor."
WINCKELMANN (Quarterly Review, p. 21, 1874.)

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Schwanthaler. There is *one* British name no doubt abreast of all or any of these, John Flaxman; but if Great Britain can furnish only one name in sculpture of the highest rank, it is not to be expected that a single city can furnish much in this regard. We are not, however, entirely destitute of native representatives even in this department of art; for though they have found a field elsewhere for their powers, two of the most eminent living sculptors in Scotland are Aberdonians, John Steell being so by birth and William Brodie by artistic education. The statue of the late Provost Blaikie by the one artist and the bust of John Philip by the other are among the ornaments of the Town House, but it cannot be said that Aberdeen possesses many other specimens of their powers. One excellent work of the sculptor's art we do however possess by a native artist who gave fair promise, had he lived, to do some notable things–the statue of the Queen in white marble by the younger Brodie. Being the first sovereign since many a century that has visited Aberdeen, the Queen deserves all the recognition that our art can accomplish, and it is pleasing to note in this statue that her love of the Highlands is symbolised by the garb she wears, the tartan being faintly but yet clearly indicated. The statue is however placed in a situation where admiration or even appreciation is placed under difficulties, for if an imaginative spectator were to suppose it animated for a moment and expatiating a few paces, say backward, he would be shocked to think of Her Majesty falling hopelessly into an ugly and dark abyss. Moreover, instead of foliage behind it, which is the appropriate background for a marble statue in the open air, our statue has a screen of plastered gables as the most prominent of its surroundings. The other Royal Statue, though a fine piece of bronze in respect of the casting, is a mistake in design, being not a man in a chair but a chair with a man in it.

On the whole one is disposed to assign a relatively high rank to another work of art, the Duke of Gordon Statue, and this on the ground of its being thoroughly native, and we may say Autochthonal. Though not perfect as a work of art, it is simple and broad in its treatment, and though granitic in expression, it is on that account the more to be approved, if not esteemed, as a product of the soil. In point of fact it is probably unique in its material in modern times, and a parallel may be sought for it only in ancient Egyptian art, where we find statues even in such hard texture and flaming material as red granite. In Græco-Roman sculpture on the other hand it was a sign

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of the Decadence to depart from white marble as the material for sculpture. This appears from the following remarks of Ottfried Müller, the historian of Ancient Art, who thus states the question of material (p. 351):—

"The solid calcareous stone, susceptible of polish, which was on account of its shining surface called *marmor*, white marble being thereby understood, was early recognised as the most fitting material for sculpture. . . . . However, in Greece, as well as in Italy, all sorts of tufa were employed for works of less careful art; on the other hand coloured marble as well as other kinds of coloured stone first came into favour in the Roman Empire, especially for the representation of Egyptian deities and barbarian kings, and also for the addition of accoutrements, drapery and the like. Wonderful is the finish of the workmanship on the hard and brittle masses of porphyry, granite and basalt, in which pointed irons, which were sharpened ever and anon, must bore away to the requisite depth, and afterwards laborious rubbing and polishing gradually bring the smooth surface to its proper state."

We have therefore the precedent, if not of Greek art, yet of Roman and Egyptian, in favour of granite as a material for statues. In Egyptian art it was in fact reserved for the loftiest purposes, for the representation of gods and demi-gods.

There is only one other remark I shall hazard on this head, and this relates to the absence of sculpture in certain positions where it might be looked for as a finish to the architecture. A stranger of critical tastes from any of the more artistic cities of Germany or Italy will be struck with the sight here and there among us of Pediments without groups and Finials without figures. On the Denburn Bridge, for example, he will remark that gas lamps usurp the place of Sphinxes or recumbent lions, and that the otherwise beautiful Façade before the City Churches has for its centre an arch with nothing in shape of trophy to support. If the arch had been in Munich or Berlin, we should have had a car of Victory driving lions or the like, but here we are devoid of such appropriate accompaniment.

Last and strongest and most enduring stands the art which in many respects is the most important of all, Architecture. Upon this more than on all others the honour of a city, æsthetically, depends: in this, more than in any other, offences or blunders are irremediable; the taste of an age may be raised or deteriorated and

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even its happiness enhanced or impaired by the wisdom or the folly, the felicity or infelicity of a single architect. Great is the responsibility of him to whom are consigned not the comfort only and convenience, but the artistic honour of many generations.

A provincial city, such as Aberdeen, cannot of course be expected to vie in architectural richness with a capital, or to exhibit such splendid piles as for example the cities of South Germany or Flanders or Northern Italy, but in measure, we may, even with our more recent civilization, be expected to produce something not unworthy of our unmatched materials.* When we have once learned to appreciate how much dignity is added to Venice or Genoa by their Palazzi and to Brussels or Tournay by their Hotels de Ville, we are able to estimate the value of an architect, and can envy him the possession of such power as he possesses to ennoble and to delight posterity.

It is an art too that has this good fortune attached to it, that with rare exceptions its monuments remain *in situ*, with the natural surroundings in which they were originally placed. The sculpture and the painting of a nation may be torn away by the hand of a conqueror, but the architecture remains a solace in the day of spoliation. Of this we have a memorable instance in later times. When the French rifled Italy of her artistic treasures, they let their architecture alone; however willingly they might have desired in their hearts to trundle over the Alps the Campanile of Giotto or the Cathedral of Pisa, fate and gravitation, though not their will, forbade. So also though Greece and Egypt may now complain that the sculpture of their temples and the decorations of their tombs are torn away to enrich the museums of the West, they have the satisfaction of thinking that the Parthenon and the Pyramids seem likely to defy the cupidity of Europe, unless indeed, among the novelties of exhausted speculation, some Joint Stock Company should be started to remove the great Pyramid to a Square in New York or to the Park at Sydenham. It is, therefore, with peculiar emphasis

* In looking at our rough and not very tractable granite, one feels thankful that we are, at all events, spared the misery of the bad brick-architecture which prevails in a good deal of modern England. The besetting sin of brick-architecture is to resort to plaster and other vile incrustations, whence falsehood, and with falsehood, extravagance in detail and flimsiness in design, whence, too, those awful phenomena, of which Ruskin speaks with not too much detestation, the suburbs of manufacturing towns and the slums of mining villages, "cities not built but rather clotted and coagulated; *spots of a dreadful mildew spreading by patches and blotches* over the country they consume."—(Lectures on Art, p. 113.)

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that Lepsius, in his letters from Egypt, dwells on the architectural remains of that country as a proof of the greatness of its ancient race, when the races living among these ruins now are, "notwithstanding all their mischievous industry, powerless even to pull them down." How far removed therefore from the mechanical science that constructed them? Fame has it that in our own city something similar took place, from which might be read a similar lesson of degeneracy. The old East Church, which was pronounced a ruin, had strength in it that taxed its destroyers to the utmost before it could be pulled down. By its destruction, in an evil hour, the citizens of Aberdeen lost the only *entire* church which they possessed, dating from pre-Reformation times.*

In taking a rapid survey of the architectural features of Aberdeen, we may naturally begin with the great church of the city in the old time, or St. Nicholas. The transepts between the two churches contain probably the oldest masonry now existing between the two rivers. The West Church stands in the place of the old nave, and the East Church is on the site of the Choir and Chancel of St. Nicholas, and the whole, we can well believe, formed what was accounted the finest parish church of the old time in Scotland.†

The West Church and the East together are sisters in more than one respect, inasmuch as Aberdeen possesses there conjoined the work of two of the most notable of her artistic sons—Gibbs and Simpson. The former was the designer of the Radcliffe Library at Oxford and St. Martin's-in-the-Fields in London; and the West Church in his own city is no mean specimen of his skill. The massiveness of the interior is well relieved by the elegance of the Corinthian pillars in the canopies of Pulpit and Provost's Chair, and the treatment of the vaulting in the aisles shows great constructive skill. If, however, we are to subscribe unconditionally to the doctrine that Gothic is the one essential style for church architecture, the West Church must be condemned; but it may be assumed that the *ipse dixit* of Ruskin is no absolute proof, though it may be a powerful presumption, and probably Aberdeen is as good a soil as any for testing the absoluteness of his doctrine. Mr. Pugin brings forward a mystic and not unbeautiful view that, as the Resurrection is the central truth of Christian Faith, therefore the notion of a risen aspiring life

* A description of the Old East or "Quire" Kirk will be fonnd in the volume of the Spalding Club, entitled "Collections, &c." (pp. 205-6-8).

† The disastrous fire of October 9th, 1874, has destroyed the old St. Nicholas Tower and the restored East Church. If the new restorations are carried out judiciously, perhaps the disaster may not be an unmitigated calamity.

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should express itself in every line of architecture so devoted, and hence the upspringing heavenward energy of the Gothic arch becomes to him, as well as to Mr. Ruskin, the true form of Christian architecture. Now it may be conceded that the Gothic arch possesses the mystic quality of expressing aspiration, but does it do so equally happily in all materials? In brick and freestone, undoubtedly, it may be doubted if it does so equally well in granite and marble. The West Church, it is true, is not in granite, but it is not to be condemned *a priori* upon the Ruskin principle, even while we admit that freestone falls best into Gothic forms. It may even be defended, if we refer to the remarkable fact that the instinct of the Italians has in these latter days, from whatever cause, confined Gothic to buildings of brick and practically abjured it as applicable to stone, whether freestone or marble. It is worth noting in passing that our modern architects build Gothic churches in Aberdeen now not in granite but in freestone. They want the church to be Gothic, but in order that it may be safely and rightly Gothic they in general seek other material than our granite.

Regarding the East Church, the most interesting parts are those surviving from the ruin of the Old East, namely, the Crypt or St. Mary's, the groined vaulting of which remains, and portions of the old transepts. Much might still be done to redeem the beauty of these transepts and display their form, and in particular to lay bare the arches on which the central tower rests, and to restore Collison's aisle or the north transept to something like decency. Some barbarians have jammed into it a furnace, profaning some of the oldest and most interesting monuments* of the city, and among others the modest epitaph of Adam Heriot, the first minister of the Word in reformed times, looks meekly down on nowise very divine service going on in its neighbourhood.

One ecclesiastical building however survives, portions of which reach back to pre-Reformation times, and which we must take leave to call the most venerable church in the city, viz., the College Kirk or Greyfriars.† There are few things it is true more forbidding than the deformities of this church on what is its visible side, but like many other things in this world the invisible side is the more

* As Ramsay says, the effigy of the Provost who fell at Harlaw was trundled out to make room for the furnace.

† History of Greyfriars Church, in Miscellany of Spalding Club, vol. I., p. 38 ff.

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worthy. That contains a series of old buttresses in ashlar work and a remarkable Gothic window of very large dimensions, which deserve a better fate than obscurity and a periodical hue and cry to have the place pulled down. The church is otherwise an interesting one historically, as built by the Franciscan Friars a little before the Reformation, some of the brethren being masons who laboured with their own hands, and also as the scene of the meeting of the General Assembly in 1640, when the Presbyterian party came north in full force to complete the work of the Glasgow Assembly of 1638, by carrying the war into the reluctant territory of the Aberdeen Doctors. It is something, therefore, to have in our city a church in which Prelatist and Presbyterian may alike take interest, where Franciscans prayed, and Ramsay, Dickson, and Henderson preached and spoke.

Few greater benefits could be conferred on the beauty of Aberdeen—it is a platitude even to refer to a thing so obvious—than to open up the front of Marischal College, to clear away the houses from the College gate as far as the Byron house, or at least to the turreted building adjoining, not only because the Marischal College would be unveiled, but because the best side of the Greyfriars Church would thus meet the view, the line of buttresses coming then first into vision, instead of not at all, as is the case at present.

One other almost equally unfortunate obstruction of a similar kind may be here referred to as marring much the contour of Aberdeen at its most vital and central point; namely, the fragment of a street which conceals from Union Bridge the most classic public building Aberdeen possesses—the Royal Infirmary. It is scant recompense to Simpson's name to allow this blemish to remain, especially in view of the Gothic spire, with which he has further enriched the prospect from that central point.

It is at Union Bridge that one can estimate not amiss what a city owes to such an architect as Archibald Simpson, when she finds such a man among her sons. To have been great in the classic style and not feeble in the Gothic, as witness his two buildings more or less visible from Union Bridge, the Infirmary and the Free Church Spire, is no mean praise, and when we add to these the little less than gems with which he has elsewhere adorned the city, such as the Maidens' Hospital in Albyn Place or the North of Scotland Bank (both of which I take it are nearly faultless in the externals, and completely satisfy the eye in beauty of proportion and harmony of

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detail), Aberdeen may congratulate itself that he has left his stamp thus visibly and nobly on his native town.

The same favourable judgment cannot always be bestowed on his Gothic or semi-Gothic buildings which, though many of them fine, as Marischal College and the East Church, are not of a fine kind, inasmuch as they are in Perpendicular or Tudor Gothic, that is late or debased Gothic, and cannot, therefore, notwithstanding their fine features in many respects, be pronounced so perfect in their kind. It is right, however, to remark that in the time when Simpson lived the different forms of Gothic were only beginning to be understood by means of the fine historical studies of Rickman, but in so far as Gothic was known in his own time, Simpson deserves great praise.

Next to Simpson as the most successful architect in recent times is the name of John Smith, to whom among other works we owe two things about as fine as any of Simpson's, though on a smaller scale, the façade before the churches in Union Street and the monument* to Dr. Hamilton adjoining it. The latter is not inferior in style, though it may be in size, to some much admired in Edinburgh, and might lend grace even to the Calton Hill. The Ionic façade is in harmony with the street of which it forms a part, and while it has no sculpture to support, and though exception might be taken to an *arch* in the centre of a *Greek* colonnade, it is an effective ornament to the town.

Regarding the artistic aspect of our streets architecturally, it is worth noting what an improvement has taken place in the mode of giving architectural expression since the building of Union Street commenced. The contrast between Market Street, much of which is from Simpson's design, and the older parts of Union Street, is in this respect noteworthy. The importance in this regard of a well-marked cornice has come gradually to be recognised, but in the older parts of Union Street the houses were built as of one solid wall, with little or no indication, by string courses, of the different stories, and the windows look as if struck out as an after thought. A flat-faced house with no cornice or well-marked bounding line will be found in general to be one of the older series, whereas those with strongly-marked cornice belong as a rule to the later or Simpson time.

* A not bad story about this monument is that Simpson, when asked his opinion about it, indulged in a joke at the expense of his professional rival. He endeavoured to run it down, and said it reminded him of nothing so much as a "four-post bed." His rival might have rejoined that for a last resting place it was something to have succeeded in suggesting to his mind an image of Repose!

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It is, however, in Castle Street that an Aberdonian may be pardoned for elevating somewhat the plumes of his pride. Not that the situation has been rightly taken advantage of, for there are several mean buildings that mar the scene, yet there are certain features belonging to it that render it remarkable. Besides the Union Bank, which is not unworthy of its position, there is the fine building of the North of Scotland Bank, which would give dignity to any modern or ancient square, and we have also the new Municipal Edifice,* on which we remark no further than that it may be looked on as unique in Scotland; but besides these ornaments, there is the Market Square itself and the Market Cross, and all Scotland may be challenged to show a parallel. As a market square of the old type, Castle Street is in fact the most spacious in Scotland.† The Grassmarket of Edinburgh is the only one comparable to it, and even it is inferior in extent, and superior only in the interest of its grim memories and dark associations. That of Aberdeen has, however, not been without its grim scenes and State executions also, as in the case of the Earl of Huntly's brother after Corrichie, when Sir John Gordon of Findlater was beheaded before the fair eyes of Queen Mary.

So the Market Cross of Aberdeen, though far inferior in historic interest and splendour of associations to that of Edinburgh, is yet superior to it in stateliness and richness of elaboration, nor, again, "can Scotland show such another." The art, it is true, is a strange mixture of the Gothic and the Renaissance, Ionic pilasters outside and groined arches within, but it is quaint and characteristic, and—what is of some note in reckoning up our tale of works—it is of native origin, having been designed by a master mason from Rayne in 1686 (Ramsay's Remains, p. 300), by name John Montgomery. The place where it *ought* to have stood is the intersection of the two streets,

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* The *county* as well as the *city* of Aberdeen has a right to no mean representation architecturally. According to Billings the former is peculiarly rich in fine castellated mansions, and though it cannot boast of Glamis, it possesses "the most of the other fine examples of that style, such as Fyvie and Craigievar. Castles, or rather castellated houses, with their picturesque terminations of turrets and gabled windows, form a peculiar feature in the architecture of Scotland, and especially of Aberdeenshire and its immediate neighbourhood."—Billings II. p. 1.

† As Parson Gordon of Rothiemay phrases it—"The Castellgait Street is a square about 100 walking passes in breadth and twice as much in length, *nor can Scotland show such ane other.*" Arthur Jonston hardly exaggerates when he says of the Castlegait (cf. p. 125 of Spalding Club Collections)—

"Ardua sidereis rutilant prætoria pinnis,
Hic ubi *planities panditur ampla fori.*"

The expression *rutilant* is worth noting for its accuracy. Any one that looks to the original building stone of which the ancient Town House Tower is composed, still visible from Lodge Walk, will understand and appreciate the description.

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King Street and Union Street, but it has been pushed away from its old position, much like the dynasty of Stuart Kings whose effigies it bears. Notwithstanding, it is about the most interesting thing you can take a stranger to see, were it not that our civic rulers of the nineteenth century have done their best to dishonour this inheritance of the seventeenth : for they have placed an indignity beside it which politeness cannot name, and one cannot now take a lady round the Old Cross to show her the portraits of the Stuart Kings.

It is a common observation that Aberdeen consists of two cities but only one street, and in a sense it is true. Most Italian towns have no more—a Corso, on which they concentrate their architectural riches. Time was, however, when Aberdeen bade fair to have another, of almost the same stateliness as her Union Street, but the promise has been marred. King Street, which was not unworthy of being named alongside of Union Street, and for which both Simpson and Smith did much by way of adornment, has been latterly condemned to be the general deposit of the refuse of society, both moral and material. Dung carts and sewage, a poorhouse, a churchyard—with a hideous barrack and a powder magazine—these form some of the attractions planted by way of adornment on the road. Some of the other inflictions were perhaps inevitable, but the endurance of this last is, I take it, the most unhappy thing in our civic economy. That a powder magazine should be tolerated on a height where it invites lightning from the clouds and gunshot from the sea, so that a hostile cruiser entering the bay could disable and disarm us in a moment, is one of the strange things that show only the force of blind custom and a stupid conservatism. There is little doubt that in all the charts of our coasts in the hands of our foreign friends such as Russia or America, who may be our foes any day, the site of that magazine is noted, and the first Paul Jones or Alabama Captain that comes our way on the outbreak of a war may blow it and us into the air. It might have been a smaller error to place it there in the days before projectiles of long range came into play ; it is little less than a crime to retain it in such a position now.

Sauntering along the King Street Road, and deploring the blunders with which it has been marred, the stranger remarks rising to his left a considerable elevation with steep and in some parts almost precipitous sides. It will be to him matter of wonder and regret that the fine sites on the brow of the Gallowgate hill are entirely lost ; and so the skyline of the Gallowgate

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is nothing, or next to nothing, though it might have been on a minor scale a counterpart to that of the Old Town of Edinburgh. That dragon ridge with jagged vertebræ of scarped cliff and spikes of spires defies, of course, all rivalry, but in Aberdeen we might have had something better than a mere huddle of meanness on the most imposing of our natural positions—a few spires, for example, where spires would have been effective and striking as the horn of a unicorn. It was only in a misanthropic moment that one whom we may claim as in a sense an Aberdeen poet, Lord Byron, when describing a scene in Albania, gave utterance to the angry words—

"No city spire *pollutes* the lovely view."

Most people will rather agree with Mr. Ruskin that spires, far from polluting, are the enrichment of a landscape; and it is pleasing to observe so many not inelegant ones within the last few years added by our living architects to enhance the architectural features of Aberdeen.

Next in effect to a few fine buildings on the brow of the Gallowgate, would be such improvements as an imposing edifice in the end of Castle Street to terminate the vista of Union Street, and a viaduct or bridge to carry the road on a level in front of the Infirmary. This last improvement would present in itself a fine object from Union Bridge, and, moreover, it would place the Infirmary upon a platform where it would stand out, as it ought to stand, somewhat like a temple on an acropolis. For this last defect in our æsthetics we cannot blame our civic rulers much, since the people of Edinburgh committed the same error, severely denounced by Sir Walter Scott, when they allowed the unsightly Mound to clog their beautiful valley, instead of spanning it with a light and graceful bridge to be a sister to the North Bridge.

The only other suggestion I venture on, appertaining to the Æsthetics, is one that would cost little and please much—the placing of *marble plaques* or inscriptions on houses that have been associated with famous men. Three of these occur to the remembrance, there may be others, but these might be a good nucleus to begin with—the Byron House in Broad Street where Byron began life, and the two in Schoolhill where Beattie and Campbell severally spent the evening of their days.*

In looking back on the historical position of Aberdeen, we find that Time has told on its relative importance in a serious degree. It

* The example has already been set in the inscription on the house in Skene Square associated with John Philip.

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sounds like hyperbole to hear the honest and, no doubt then, just judgment of the antiquarian James Gordon, 200 years ago, that "it exceeds not only the rest of the towns of the North of Scotland, bot likewayes any citie quhatsomever of that same latitude for greatness, bewtie, and frequency of trade." It is evident that any thought of such cities as Copenhagen and Petersburg had not dawned on the worthy Parson of Rothiemay. Moreover, Aberdeen has fallen relatively to the rest of Scotland. In the days of the Covenant it seems to hold a position only second to Edinburgh; it is now only fourth in population and wealth among the Scottish towns. This declension renders it all the more desirable that its citizens should make up for their inferiority in material resources by superiority in their mode of handling them, in Art and in Culture, expressing themselves in all noble forms.

In conclusion, our position artistically may be thus summarised: in two of the Fine Arts, if we cannot lay claim to much invention and originality, yet we have shown considerable taste and appreciation, viz., in Music and Sculpture; and in the remaining two, viz., in Painting and Architecture, we can claim a large amount of original production, and that in a quality nowise to be despised.

November 11, 1873.—PROFESSOR OGILVIE, *Vice-President, in the Chair.*

PROFESSOR GEDDES read a paper "On Local Aspects of the Fine Arts." Part II. On Architecture in Old Aberdeen.

Local Aspects of the Fine Arts. By PROFESSOR GEDDES.

II. OLD ABERDEEN.

IN a former paper an attempt was made to indicate some of the local aspects of the Fine Arts so far as exemplified in Aberdeen, and in doing so we drew attention to what we may fairly call the native products of the soil in Painting, Sculpture, and Architecture. It only remains to attempt a descriptive criticism of a similar kind of the architecture remaining to us in Old Aberdeen.

Though there is considerable variety in the architectural features of the Old Town, embracing, among other things, Moorish minarets and ancient gables turned *more Scotico* to the street, as in the old unquiet times, the only buildings to which I shall refer as

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claiming attention in an artistic sense are the Chapel of King's College and the Cathedral. On each of these, however, considerable study might be expended, and there are not a few suggestive points of artistic and historical interest illustrated for us in their structure.

To begin with the College Chapel.

In studying old churches probably one of the first points to which an ecclesiologist would direct his attention, is the line in which they lie as to orientation.

The position both of the Chapel and the Cathedral is, in this respect, well defined, and indeed remarkably similar, and one has no difficulty in understanding the correctness of their ground-plan, as on a line fairly and clearly from west to east. The amount of variation from due east in the old churches of the country is, however, sometimes considerable, and occasionally even surprising and perplexing, as in the case for example of the Greyfriars Church in Aberdeen, the original portion of which seems to lie rather in a line from north to south, so that it would make a very acute angle with the line of the old East Church produced or with that of the ecclesiastical buildings of the Old Town. The ground-plan of all these buildings dates from before the Reformation time, from a period, therefore, when these things, it is supposed, were specially studied. The principle that is believed to have determined the variation is said to have been the point of sunrise for the saint's day to whom the church was dedicated, whence it resulted that there might be a quadrant of a circle of variation according as the sun was found to rise for a saint's day in June or for a saint's day in December. The finest expression has been given to this view in a poem of Wordsworth's, containing the following lines :—

When in the antique age of bow and spear
And feudal rapine, clothed with iron mail,
Came ministers of peace, intent to rear
The Mother Church, in yon sequestered vale,

Then, to her Patron Saint a previous rite
Resounded with deep swell and solemn close,
Through unremitting vigils of the night,
Till from his couch the wished-for Sun uprose.

He rose, and straight, as by Divine command,
They who had waited for that sign to trace
Their work's foundation, gave with careful hand
To the high altar its determined place,

Mindful of Him, who in the Orient born
There lived, and on the Cross his life resigned,
And who from out the regions of the morn,
Issuing in pomp, shall come to judge mankind.

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Beautiful, however, as this idea is, it is doubtful whether it will explain every deviation from the proper orientation.* In the case of the Greyfriars Church it is not unlikely that the line of Broad Street, to which it lies contiguous, had, to some extent, determined the direction of the axis of the building.

Passing from the orientation, about which, in the case of the Chapel, there is no mistake, we next notice the frontispiece which that building presents in the shape of a long inscription on its western front. We have the date and foundation of the Chapel there presented to us in the most authentic and palpable form, in solemn declaration that

"*By favour of the most serene, illustrious, and victorious James the 4th*† *the masons began to build on the 2nd April, in the year 1500.*"

It was fortunate that they allowed the first of April to pass, which would have been an unlucky day to begin the foundation of a University. The irony of History, however, throws a strange light on the magniloquence of this inscription. Thirteen years later the "victorious" king lost both life and victory at Flodden. Even in the foundation of a seat of Learning,

Nescia mens hominum fati sortisque futuræ.

One thing we are especially disposed to approve—the great good sense these old masons showed in putting the Inscription on the face of the Building, not obtrusively, but yet clearly, for the benefit of all eyes that cared to inquire.

It is true that Ruskin has somewhere given a verdict against alphabetical characters or monograms of any kind on the face of buildings, a principle which would deprive us of coats of arms with their inscriptions, all heraldic insignia, and much that illustrates and beautifies architecture. The old nations of Egypt and Rome, both of them great architectural races, had other feelings in this matter—they seemed, on the contrary, to glory in inscriptions, and rise up indignant against the critic's judgment. No doubt there may be offence in making an inscription too conspicuous; it ought to be edged in as an embroidered border, not flaming broad and large,

* According to Fergusson this practice of orientation is much more characteristic of the North of the Alps than of the South, and if it is exemplified South of the Alps, it is only in the half Germanised cities of Northern Italy that it is fully or ordinarily observed.

† It is worth noting that a common 4th figure is used as a definition of the King, and the Arabic numeral has a strange effect among the Saxon letters and Latin words. The same thing appears on the coins of this King, and both occurrences are probably explained by the comparative newness of the Arabic numerals, which had not as yet lost dignity by less noble use.

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as is the case with the gigantic and haughty inscription on the face of a well-known Castle in our county—Strathbogie Castle at Huntly—which tells of the pride of "George Marquess of Huntly." Certainly, the scroll that records the foundation of the chapel does not offend in this respect, but, at all events, it is *there*, on the face of the building, and very sensible, we think, was the way of doing things in 1500 compared with the way in 1800, when anything that can verify the date and circumstances connected with the founding of a building is generally banished to out-of-the-way corners, or buried under the foundation-stone, and so antiquarians can *authenticate* the origin of our buildings only when the building has ceased to be.

Another of the brave things about this inscription is that it hangs on one side of the door without any pendant to balance it. I am afraid our modern ideas of symmetry would demand that the inscription had been divided or placed over the doorway so as to balance itself, but the latter place, *that is*, over the doorway, was excluded, as this would have interfered with the west window, and the architect evidently wanted to have as large an area for his west window as he could conveniently command.

The style of Gothic in which the west window, and indeed all the original windows are constructed is very peculiar. There is no other example in Scotland, and none said to be in Europe except in Flanders,* and there only in a few instances. We are afraid it must be called not the higher style of Gothic, but, on the contrary, a very debased style, when the flamboyant was falling into falsehood and decay, for the architect seems to have lost confidence in the bearing power of the arch, whether Roman or Gothic, and hence he has inserted, in the middle of these windows, a huge and somewhat clumsy bar or shaft to bear up, or prop up, the keystone of the arch. On either side of this central pillar in the large west window are minor pillars that do not offend in that respect, for they show braver treatment, and are made to branch out tree-like and leave airy spaces for the light among their branches. What was the precise reason for the clumsy central shaft—why it was not made to curve and fall into

* From a discovery, made since the above was composed, I am able to specify an example in Flanders of the same style. In Fergusson's Handbook of Architecture, p. 733, will be found a description and figuring of a degenerate form of Gothic, which will be recognised as in all essentials identical with the architecture of King's College Chapel. The heavy central mullion and the pear-shaped large loop lying obliquely on its side will be recognised, from the accompanying cuts, in both. The example given by Fergusson is from the Bishop's palace at Liege, and it so happens that it is almost contemporary in date, (1508), with the erection of the Chapel.

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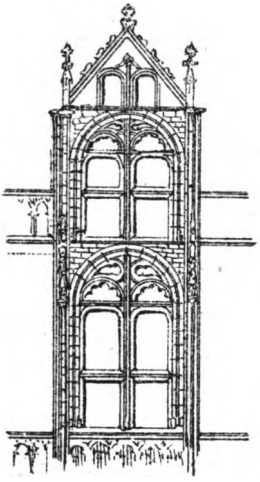

FIG. I.—WINDOWS IN BISHOP'S PALACE, LIEGE.

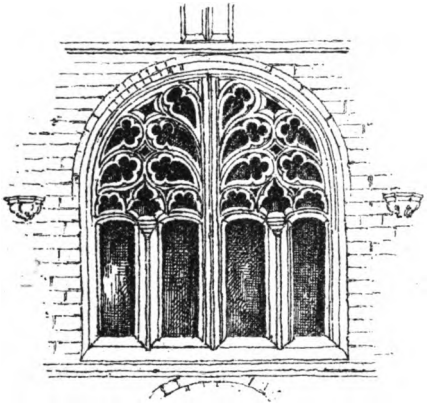

FIG. II.—WINDOW IN KING'S COLLEGE CHAPEL.

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branches like the smaller ones at its side, is not very clear. It probably enabled the architect to make his window broader and ampler in space and thus to counteract the narrowing tendency of the pure Gothic, which delights to run up into lancet forms.

The chapel itself is in form one of an ancient Scottish type, without transepts or aisles, a long and simple building terminating in a triangular apse. The old churches of Cowie near Stonehaven and of Gamrie near Banff, both sisters in their beauty of position and lonely ruination, may be named as of the same order in this respect. There is no attempt at giving a cruciform shape: that seems to have been the case chiefly where there were pillars to break up the area into nave and aisles. A very curious circumstance is that the great lights of this chapel are, almost all, on the *northern* side, and, what is still more remarkable, there is no uniformity in their proportions, for they are all of different altitude, and their vertices form a most irregular line. The view of the interior, now that all the barriers have been cleared away by recent changes, is probably finer than it has ever been since the Reformation; and when decorations such as it originally possessed in stained glass windows and the like are once restored to it, it may rank high among the architectural ornaments not of Aberdeen only but of Scotland. The vista as you look from the east end across the now distant screen to the large and ample west window is very beautiful, and will be one of the most pleasing things we know when once the harshness of colour arising from raw plaster is removed, and when the whole is refitted in becoming style with the richly ornamented west window in the distance which is to be presented by a generous donor.

Hardly inferior in interest to the architecture in stone is the carving in wood, still adorning the interior of the chapel. Being unique in Scotland as the only complete specimen of a choir preserved to us, it has been adopted as a model for the restoration of the carved woodwork of St. Giles, and on other grounds deserves a minute examination. It consists of thirty stalls or sellæ with flowered canopies for the canons and twenty-two subsellia for the choristers underneath. Each of these had been furnished with a *miserere* or folding seat, but only eight or nine of these last in their original form remain. It is singularly suggestive of the intense desire in the old days to leave no part unadorned that the under part or obverse of the original *miserere* seats bears some significant emblem—a flowered pattern, an inscription such as the monogram I. H. S. (Jesus Hominum Salvator), or other similar decoration. The favourite vegetable forms

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that occur in the decoration of the screen are the oak leaf with acorns and the vine leaf with grapes, which last circumstance may fall in with the idea that has been entertained that the carving was not done in our country or *in situ*, but in some land of the vine, and there is some ground for the conjecture that Bishop Elphinstone had found the whole structure ready-made somewhere in France and brought it over, for if it had been done *in situ* there would have been evidence of a stronger desire than now appears, to assimilate the carving to the character of the windows and the architecture generally. If so, we must resign the notion of claiming the carved work of the chapel as a product of native Scottish art.

There is one vegetable form introduced, which would seem at first sight to point to a different conclusion. In one of the compartments is a splendid group of the wild flower called the Scotch thistle, but this circumstance, I am afraid, is not by any means conclusive in favour of a Scottish origin to the wood-carving of the chapel, and for the following reasons.

The earliest *historical* reference to the thistle as an emblem of Scotland is the poem of William Dunbar entitled the "Thistle and the Rose," suggested by the marriage of James IV. of Scotland to Margaret Tudor of England. This poem was finished on the 9th May, 1503, about the time when the chapel was being organised. How long previous to Dunbar this homage to the thistle* had extended we have no certain trace. The foundation of the Order of the Thistle begins only in the subsequent reign, that of James V., to whom is attributed the institution, others say, the restoration, of "the most *ancient* Order of the Thistle." The so-called institution by Achaius, the reputed ally of Charlemagne, is historically untrustworthy, and the traditional story as to the occasion when it was chosen as the national emblem from an incident in the wars with the Danes, must also be dismissed as without any proper verification.†

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* If we could accept the derivation of *Caledonia* which some have given, from the Welsh *called* (thistle stalks), it would be of immemorial antiquity. Pinkerton has remarked (Hist. of Scot. II. p. 36) that the first *authentic* appearance of the thistle as a Scottish badge is in Dunbar's poem, and in the account of Margaret's reception and wedding (August 1503), where it is called a *chardon*.

† This incident is thus told in Notes and Queries (vol. V., p. 281, 1852), and the story is a good one. "The origin of the national badge is thus handed down by tradition :—When the Danes invaded Scotland it was deemed unwarlike to attack an enemy in the darkness of night, instead of a pitched battle by day; but on one occasion the invaders resolved to avail themselves of stratagem; and in order to prevent their tramp from being heard, they marched barefooted. They had thus neared the Scottish force unobserved, when a Dane unluckily stepped with his foot upon a superbly prickled thistle,

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On the other hand the thistle appears in French art considerably earlier, before the time when we can detect its appearance in Scotland, the French name of it, *chardon*, having suggested its introduction in rebuses for *cher don* or *dear gift*. The Bourbon chapel at Lyons* is largely adorned with this emblem: it is known to have been built by a son-in-law of Louis XI., and the flower is allusive to the *cher don* which the King had given him in the gift of his daughter. Louis XI. died in 1485, fifteen years *before* the founding of the King's College Chapel.

It is only in the reign of James VI. that the thistle comes to be finally established as the national emblem, appearing for the first time on the coins, the so-called *thistle merks*. Thus we are inclined to think that the brave thistle in the wood-carving at Old Aberdeen is probably the oldest occurrence of it in art in Scotland—the *avant courier* of all the subsequent glorification it has received.

Besides the wood-carving of the stalls, it is proper to refer to the two pulpits in the chapel, which are in their several ways artistically noticeable. The one richly decorated, belonged originally to the Cathedral, where, however, it must have been out of place with the severer character of the building as it exists to us now, although it may have been in beautiful keeping with the richer decoration of the perished choir, and the still remaining exquisite tomb of Gavin Dunbar in the south transept of the Cathedral. This pulpit bears the arms of Walter Stewart, one of the later Roman Catholic Bishops, and may be claimed as probably a native specimen of art. The other pulpit is interesting in its way, but far inferior as a work of art. The Renaissance has affected even the wood-carving, and the feeling for true Gothic has entirely perished. The declension in art is as great between the pulpit of Bishop Stewart and that of Bishop Patrick Forbes, as between the tomb of Gavin Dunbar and that of the Scougals in the Cathedral, and one has only to look in either case at these later productions to be sensible of the evil the Renaissance introduced into ecclesiastical decoration.

Next to the Chapel and the carved stallwork, interest attaches most closely to the Bell-tower or Campanile at its south-western corner. The buttresses with which it is ribbed are worthy of note for their structural purpose; they are true buttresses, and are seen,

and uttered a cry of pain, which discovered the assailants to the Scots, who ran to their arms, and defeated the foe with great slaughter. The thistle was immediately adopted as the insignia of Scotland."

* See Murray's "Handbook to France," under "Lyons."

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as it were, to strain and strive to bind the building together, and keep its bones in due position. Compare the buttresses in the modern restored front adjoining; they are flaccid and feeble, seeming to lean like a ruler against the wall and to *need* support instead of giving it, whereas those ancient giants take a firm bite, if we may so express it, of the resisting wall.

The form of the Crown or lantern with which the tower is surmounted is a remarkable specimen of architectural symmetry and grace. On four supporting arms, meeting in an arch, is raised a stone crown, surmounted with the usual symbols of majesty, the ball and cross. It is well described by an old authority :—

"Above a double arche crossed of stone, there standeth a crown royall, octangular, supported with eight pillars; upon the top of the crown a stone globe; above it a double cross guilded."—From p. LX of Fasti Aberd: (Spalding Club).

In every variation of position the four-armed arch, with its jewelry of stone, is beautiful, whether the four arms are seen separately, or whether one is concealed and three come into view, or two are in shade and the whole comes to appear as a single arch. It is interesting to know that this specimen of our northern architecture is, in execution at least, the product of Reformation times. The original crown, which dated from before the Reformation, would seem to have been less substantial; at all events it is known to have been blown down by a storm in 1633, but under the auspices of Bishop Patrick Forbes of Corse it was "*re-edifiet*," as Spalding says, "and biggit up little inferior to the first." Judging from its stability it was "re-edifiet" better, for it has stood upwards of two centuries, its predecessor having perished in little more than one. The only other remark we shall make about the Crown Tower is that it is interesting as one of four brethren, three of them, as is well known, being on Scottish soil, and one just across the Border, viz., the tower of St. Nicholas Church at Newcastle. The other two in Scotland are, the small edition, in the case of the Tron Tower, in Glasgow, and, best known of all, and most fortunate in its position—St. Giles of Edinburgh. This form of tower was more common in Scotland formerly, but some specimens have been allowed to perish. Linlithgow Tower is known to have been so surmounted: also the Abbey Church of Haddington; and some have said the Steeple Tower of Dundee was once an instance of the same. The only one* that can compare,

* The tower of St. Nicholas at Newcastle seems to us inferior, as it is

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however, with that of the Old Town of Aberdeen, is St. Giles; and notwithstanding the authority of Billings, who says St. Giles is of all the Scottish instances at once the richest and lightest, we venture the assertion that St. Giles is the second, not the first in beauty. It is, in the first place, confused by being not quadragonal but octagonal, the arches springing not only from the four corbels at the corners of the tower but also from the middle of the walls—a multiplicity from which the Northern Crown is free—and, in the second place, the upper portion of it is inferior in airiness, having no second or upper crown, and therefore no pierced work like the crown of King's, but ending in a stalk tapering into a spike. The only feature in which St. Giles surpasses King's, besides its commanding situation, is the exquisite pierced work of the parapet, whereas our northern tower is without any ornamentation in its parapet except simple embrasures. Nowhere do we feel more forcibly than in looking up to the crown of Old King's that an architect can turn the common stones of the highway into jewels, and render them radiant with all the effect of starlight by the manner of the setting.

Passing to the Cathedral, we find ourselves in the presence of not indeed a beautiful but a massy and powerful structure, impressive from its very rudeness and bareness. The hard and severe lines of the building and the disdain of all ornament, or, shall we call it, despair of all ornament, in the intractable material of which it is composed, render it unique in Scotland not only as a granite Cathedral but as reflecting in stone an image of the hard-featured, stern-souled people among whom it has been reared. The sternness* that belongs to what the poet calls our "rugged strand" and which speaks out in our national character and history often with such grimness, culminates here in our architecture in characteristic typical form.

The unity of impression which the aspect of the Cathedral now makes is due to its condition under the injuries of time. It had not been so always: when it was a complete building with choir and transepts, there may have been more beauty, there must have been much more softness, but there had been less of that severe unity such as impresses the spectator now. The parts that have perished were

somewhat confused and crowded in design. It certainly wants the classic grace of unity, which the Crown of King's undoubtedly possesses.

* The military and feudal air of the western towers, with their donjon-looking keeps and narrow eyelets, has a good deal to do in giving the stern expression which most people will consider to be the dominant one in the edifice as a whole.

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of freestone, hence the reason why they have perished so completely, and they were in probably more ornate form, but the parts that remain are, with the exception of the upper portions of the spires, of granite, and it is remarkable how at the transition to where freestone had been introduced there we find the building as it were bursting into flower, ornament and tracery springing out the moment you pass from the granite to the freestone, with much the same regularity as we find in the topography of the country the flora of a sandstone district surpassing in richness the flora of a granite one. Compare for example the granite pillars of the nave with the freestone pillars at the end of the nave supporting the old central tower; the former are without wreath or any ornament but the simple capital, the latter are flowered with rich though fantastic ornamentation—mermaids and mermen circling in strange procession. The same thing is seen also in the ribbing and filleting of the freestone tips of the spires, contrasting with the bare unbroken hardness of the fortress-looking towers through their entire granite structure underneath.

The beauty of the situation of the Cathedral and its general surroundings is lost to the great majority of those who visit it, unless they take the trouble to survey it, as few we fear do, on its northern side. It is from the banks of the Don that it wears its most commanding aspect, and we feel inclined to give a measure of credence to the beautiful story which associates the windings of the Don at that point with the choice of the situation for the future church. The story is thus told by Innes in his "Civil and Ecclesiastical History of Scotland" (p. 194 Spalding Club).

"St. Machar was born of noble parents in Ireland and at first named Mochonna . . . . . He had followed St. Columba into Britain, and after he had made more than an ordinary progress in piety and in learning in Ycolmkill, St. Columba having caused him to be advanced to holy orders, and afterwards to be consecrated bishop, sent him with twelve of his disciples to preach the Gospel in the most northern parts of the Pictish provinces, admonishing him to settle and erect a church upon the bank of a river where he should find that by its windings it formed the figure of a bishop's crosier. St. Machar, following this admonition, went on northward, preaching the Gospel till he came to the bank of the River Don, near its entry to the sea, at a place where, by its windings, the river makes the foresaid figure of a crosier, and there he built a church, which still bears his name, and became the Cathedral of Aberdeen in the time

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of David I., who transferred the bishop's seat from Mortlach to the Old Town of Aberdeen."

What was the nature of the edifice which St. Machar erected or what buildings preceded the erection of the present church, we have no means of knowing. The time of the foundation of the existing nave cannot be placed further back than the middle of the fourteenth century. The most important document relating to its foundation is the interesting "Grant of Indulgences"* by Pope Clement VII., designed to help in the erection of the "Navis" or Nave. It is given in the "Registrum Episcopatus Aberdonensis," p. 133 (Spalding Club), and is important in more than one particular, as showing (1st) that Scotland followed the lead of France in the time of the Schism and adhered to Clement VII. against the claims of Urban who was upheld by Germany and England, and (2d) as being issued from Avignon during the period of the so-called "Babylonish Captivity," and at a time when two of the most famous ecclesiastics in the history of the Diocese of Aberdeen were ministering in the then new Cathedral, viz., Alexander de Kyninmund, the second bishop of that name, and John Barbour, Archdeacon of Aberdeen and the Ennius of our early Scottish Poetry.

In examining the features of the Old Aberdeen Cathedral, it may be worth while to notice to how large an extent the arithmetical relations go by odd numbers, not by even. The towers, it is true, seem by their duality to contradict this, but it was not so originally: the central tower, which stood till 1689, had given the effect of imparity, so that the towers had obeyed what seems to be a law of the Gothic proportions.† The great west window has *seven* lights; each of the

* The following are among the most important extracts :—

"Concessio Indulgentiarum pro edificatione ecclesiæ cathedralis Abbirdonensis.

Clemens episcopus, Servus Servorum Dei . . . . . cum itaque sicut accepimus pars quæ *navis* dicitur ecclesiæ Abberdonensis propter ejus vetustatem funditus sit distructa et venerabilis frater Alexander [Kyninmond] Episcopus Abberdonensis ac dilecti filii capitulum ipsius ecclesiæ eam reparare opere valde sumptuoso inceperunt, ... nos cupientes ut ecclesia ipsa congruis honoribus frequentetur ac etiam reparetur, et ut Christi fideles eo libentius ad eandem ecclesiam causa devotionis confluant et ad dictam fabricam promptas manus porrigant . . . . .

[*then follows mention of the various feasts and fasts during which, if the church is visited on pilgrimage*]

unum annum et quadraginta dies de injunctis eis penetentiis misericorditer relaxamus.

Datum Avynione, sexto nonas martii."

The Nave was in process of building about the year 1379.

† The contrast in classic art is remarkable. The number of columns in the front and rear of a Greek temple was *never* uneven. Is it an accidental

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south windows with one exception has three lights, the mouldings of the doorway group themselves into three bands, the number of arches is *seven*; and of the three rows of shields the number is also an odd number. The subtlety of this instinct or principle appears to reside in the property of the fundamental number *three*, which is seen in the triple division of the area into nave and aisles, and which, without rising to any higher theological reason, may be explained by the circumstance that the number Three affords to a group always a visible centre, and so contains what Aristotle styled the parts of perfection, a beginning, a middle, and an end. This property of the number Three of admitting what we may call *centrality*, is possessed by all the early odd numbers, more dimly discerned however as they increase in complication, until we reach a point where our powers of observation fail to discern in mass any distinction between the odd and the even.

In the present building the importance of this principle as to triplicity of form is brought home to the spectator, more especially when he contrasts the north aisle windows with the south. The latter are in their original form of three lights, but the former have been murdered by restorations a generation ago, and we hardly know whether to quarrel most with the wooden mullions in those windows that have supplanted stone, or with their division, almost universally, into two lights instead of the normal Three, thus destroying the balance that should have subsisted between the two aisles.

The choir and transepts of the Aberdeen Cathedral, as before remarked, have perished, and that so completely that it would be difficult to trace the outline of the choir, and the shape of the apse does not appear to be determined. In all probability it was a rounded apse, but only excavations could determine this point satisfactorily. Whether there was a Lady Chapel as in the case of so many other Cathedrals, does not seem to be known: probably there was no separate portion with this name, as the church is often spoken of as dedicated jointly *Beatæ Mariæ et sancto Macario*, and hence we find mention in chartularies of an altar to the Virgin, which is called a High Altar (p. 151 of "Collections, &c.," Spalding Club).

coincidence that the same contrast should exist between the Classic and the Romantic Drama, where the *five*-foot Iambic of Shakespeare stands confronting the *six*-foot Iambic of Sophocles? The fine instinct of Goethe has embodied the contrast in a remarkable form. The second part of Faust, where it deals with the medieval and the romantic, is in the *five*-foot metre; but a foot is added when it comes to deal with the Renaissance and the Classic style.

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Though the Cathedral as a whole is Gothic, yet it is not altogether or even largely Gothic, if by Gothic we mean the *pointed* Gothic. Very much of the structure is what Mr. Fergusson does not hesitate to call "Round Gothic," what others have been accustomed to call Norman or Romanesque. Indeed the only feature in the building that is strictly *pointed* Gothic is the form of the windows in the south aisle, to which, more than to any other external part of the building, is due the impression of its being a Gothic edifice. It is true the arches of the nave are pointed, but the piers from which they spring are of the cylindrical Norman order, and, what is more remarkable, the clerestory windows *above* the pointed arches of the nave return to what was apparently the favourite rounded form. The west window also is in its seven lights distinctly Norman; so is the ancient door of the south transept, and the arched tombs, such as Gavin Dunbar's, are likewise rounded. The compromise between the rounded and pointed Gothic is best seen at the western door, where the architect has paid homage to both styles, breaking the door into two pointed segments, but enclosing them both in an arched recess, which shows the round sweep of the Norman arch.* The remark of Billings as to the similar doorway of Dunfermline is appropriate here.

"The great western doorway is within a deep semicircular arched recess of that [rich] Norman style, which we find in Scotland to have gradually been mixed up with the later forms of Gothic architecture, retaining its semicircular shape in the doorways of buildings, of which all the other arches are pointed." (Billings, on Dunfermline Abbey.) This is a statement of the fact, but it gives no explanation. What was the reason, it may be asked, why the Scotch architect retained so frequently in the case of the western doorway of a Gothic building the Norman form? The answer is to be found in the freedom which this form gave him with regard to his west window. It enabled him to keep the doorway low so as to give full dimensions to his window, whereas, if he adopted the pointed arch, the finials of his mouldings would stretch up and encroach upon his window space, pushing his window up to what might otherwise be an inconvenient elevation.

The cylindrical pillars of the nave next claim attention. Here they are found not only without shafts or mouldings, but supporting *pointed* arches. The same combination occurs in two most interesting Scottish buildings, the Cathedral of Iona and that of Dunkeld. The

* The same feature occurs in the Norman Triforium, or rather Diforium, of Jedburgh, where the two *inner* divisions of the semicircular sweep are in the pointed form.

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former has in the nave precisely the same form of pillar, but with more decoration of capital than in Aberdeen, with beautiful foliage or wreathed fantastic figures, whereas in Aberdeen the material would mould to nothing but a simple turban-like band round the head of the column, or, at all events, the instruments available in those days were unequal to the task of producing anything of a more decorated character. The observations of Billings as to the combination of Round and Pointed Gothic at Dunkeld and Iona are applicable also here. Of Iona he says :—

"In the Cathedral of Iona the oldest pointed form or early English prevails ; while the circular pillars and their decorations are the lingering vestiges of the previous type."

Regarding Dunkeld he observes in words that are equally applicable to Old Aberdeen Cathedral :—

"The circular pillars might in England have been held to point to the Norman period, although an examination of their proportions would, wherever they were met with, show that they did not legitimately belong to that peculiar style. It has been found, however, in Scotland in many instances, that features which have generally been considered peculiar to the Norman, have descended far down through the later developments of Gothic architecture."

The next feature of the interior, which would strike the eye of an ecclesiologist, is the somewhat singular absence of a Triforium. There is no attempt to light up by a row of small arches, as was so often done in the great Cathedrals of the south, the blank space* intervening between the arches and the clerestory. In fact it would appear that the upper stages of the building were not carried out in the Cathedral on the ample scale of the lower stage, and the blank space usually occupied elsewhere by a Triforium, along with the clerestory, would seem foreshortened or even disproportioned, judging from their smallness, compared with the understory of columns and arches. The omission of the Triforium† adds, no doubt to the general feeling of robustness and rude strength pervading the interior, and is in keeping with the absence of mouldings round the southern windows and the plainness of the capitals and arches, in which flowers and finials are disdained.

* The name given in old Scottish records to the space occupied by the Triforium in other Cathedrals, is the *blind story*, and it is a name aptly descriptive.

† The passage which usually went along by the Triforium is not forgotten, but is found here transferred to the clerestory and combined with it, so that there occurs a passage in front of the clerestory windows.

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After the fine rows of granite pillars, with their rich warm colour, now recovered to view, perhaps the most striking feature of the interior is the roof of the Nave, with its triple row of Heraldic Shields. This ceiling is panelled in decorated squares, and the shields are inserted as knots at the intersections. It is known to have been constructed by Bishop Gavin Dunbar, who filled the See from 1518-1531, and it is among the finest and richest of its kind. And here the question arises, what is the relation that such a horizontal ceiling of wood bears to its rival form, a vaulted ceiling of stone? Is it comparable in effect to the much more difficult structure of such a roof as that of King's College Chapel, Cambridge, with its magnificent fan-tracery hanging overhead in solid stone? The Cathedrals of France and Spain are for the most part roofed with stone, so that conflagrations might break out within, consuming the furniture, and yet leave the shell of the building ready for service next day. Such an advantage could not be asserted of the wooden roof of Old Machar,* and to that extent it must be admitted to be inferior in structural ingenuity and power. Moreover, it is liable to criticism, if not to censure, as interfering by its flatness with the upward aspiring character of the pointed Gothic, but this criticism is disarmed, or at all events, loses much of its force, when it is remembered that at least one half of the features of the Cathedral, as it now stands, belong to the Norman or round Gothic style, with which the flat roof may be held not inaptly to harmonise.

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* There is however much higher authority for the employment of a wooden roof in the most noble buildings than most people suppose. There is not only the splendid example of Westminster Hall, which Fergusson pronounces "as noble as any [stone] vault in the kingdom" (Handbook, p. 881); we can appeal to the most ancient church now existing in Rome, Santa Maria Maggiore, of the fifth century (about 432, Pope Sixtus III.), where there is a flat wooden ceiling over the centre compartment. The wooden roof was, in fact, characteristic of the Early Christian Basilica, and Fergusson considers Santa Maria "the very best of all the wooden roofed churches in Christendom" (Handbook, p. 491). He elsewhere states the question in a form which those who depreciate such a roof as that of Old Machar Cathedral would find it difficult to controvert. "It is true a vaulted roof was impossible with such spacious dimensions [as those of the Basilicas]: but, is a stone roof really an indispensable requisite for internal beauty? May not wood and metal, properly used, be allowed sometimes to supply its place? No one will deny the beauty of the Gothic vault, but when we consider the *tours de force* required to suspend it in the air, and how much both internally and externally was sacrificed to obtain it, we may perhaps be permitted to ask, if it is really an unmixed triumph" (Fergusson's Handbook, p. 507). If any higher authority were needed to defend the ceiling of the Cathedral, we might refer to a building of loftier associations than any Cathedral can possess—the Temple of Solomon. The remarkable statement remains regarding its interior "all was cedar, *there was no stone seen*" (I. Kings vi., 18).

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The real reason, however, I believe why the *dernier ressort* of a wooden ceiling was adopted was not only inability to finish on the splendid scale on which the building was begun, but the immense structural difficulties of dealing with a vaulted roof where granite was the stone the first designers had to employ. The tremendous lateral thrust of such a mass would have required enormous buttresses, and it is owing to the employment of a wooden ceiling that there is no attempt at flying buttresses to support the clerestory of the nave, because it was thought none were needed when the lighter roof came to be employed. The flying buttresses we do not regret. They tend rather to confuse the view and interfere with the general air of harmony and repose that ought to prevail in such a building. Accepting then the inferior ceiling as a necessity, we can only say of it that it is a beautiful device, and that, in the mode in which it was handled, it is a noble consecration of earthly dignities and honours, a splendid realisation of the idea in the verse of the Psalm where it is said :—

"The Shields of the Earth belong unto the Lord."

Into the very tempting region of Heraldry and Archæology embodied in its blazonry—now nearly four centuries old—we must not enter ; the nature of the paper and its limits, already sufficiently long, forbid such a course. And, therefore, I conclude here this survey of Architecture as exemplified in the Old Town.

February 3, 1874.—MR. NORVAL CLYNE, *President, in the Chair.*

MR. JOHN WILLET, C.E., read a paper, "On the Present Aspect of the Sewage Question."

The Present Aspect of the Sewage Question. By MR. JOHN WILLET, C.E.

THE object of this paper is to give a description of the present state of the sewage question, and, in bringing the subject before the Society, I have considered it necessary to divide it into two parts.

1st, A description of the systems adopted for draining towns and conveying the sewage by outlets placed on the sea shore, or into rivers and streams.

2d, An account of the various methods tried for utilizing and

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purifying sewage after reaching these outlets so as to render it admissible into rivers and streams.

1st, By what is now called the "Water Carriage System" of conveying sewage from the interior of towns, the art of effecting the rapid removal of the excretal and other refuse has been brought to considerable perfection, and little improvement can now be made as regards the material or the form of sewers and drains required. The results are also so far satisfactory, — the death-rate per 1000 of the inhabitants having been lessened by a considerable percentage in most of the towns where drainage systems had been introduced. The published returns of the Registrar-General and other authorities show that this diminished death-rate is more apparent in several of the English towns than in the seven largest cities of Scotland.

This difference appears to be explained by the fact that in towns situated on low-lying ground, or on extended plains, as many of the English are, where there is a difficulty in getting rid of the subsoil drainage, the sewers (which are laid down from 8 to 10 feet under ground) not only carry off the sewage flowing from the houses, but also the water that formerly saturated the soil.

To effect this latter purpose the sewers must be built of pervous materials to admit the water through the side walls into the interior. This, of course, raises another serious question in the case of outlet sewers subject to be tide-locked, or, where, from any cause, the sewage gets dammed back and becomes stagnant, as then there is the risk of its getting through the side walls of the sewers and soaking the soil. When there is the chance of this evil occurring, the safest plan is to adopt the earthenware pipe system, which ensures impervious drains, the subsoil water being allowed to find escape under, or along the sides of, these earthenware pipes.

Although many different opinions are held as to the best system for draining towns, there is one point on which all having any skill or experience on the subject are agreed, and that is the desirability of getting the sewage carried through the pipes and sewers as *quickly* as possible.

Chemical analysis has shown that, until putrefaction has begun, the gases generated in the interior of pipes are comparatively innocuous, but, that, if the sewage is allowed to stagnate or remain longer than 24 hours in the sewers or pipes, the exhalations become not only very noxious to the senses but highly dangerous to health.

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One of the first problems which fell to engineers to solve was to determine the best form of conduit, and best description of material for insuring the maximum velocity due to the varying declivities and volume of fluid matter that would have to be conveyed under the streets. As to the best form of built sewer that would give the greatest velocity to the fluid which was daily, and sometimes hourly, varying in volume, it was found, after many experiments, that the egg shape best answers all purposes, making the narrowest end the invert, or bottom of the sewer. The inverts are now made so small that they are reduced to a radius of curvature of from 7 to 8 inches. When the dry weather flow is small the fluid is confined to a very narrow space, thus ensuring the greatest hydraulic mean depth at every increase or diminution of the volume of sewage; in other words, securing the maximum velocity due to the gradient, whatever the volume of fluid.

As regards the best material for sewers, vitrified fireclay pipes (glazed inside) have been found to answer the first requisite—that of allowing the greatest velocity, and for all ordinary purposes no other material has yet been found to surpass them. They combine cheapness, strength, and cleanliness, while the glazed interior surface reduces the friction on the fluid flowing through them to a minimum. The glassy smoothness of the interior also prevents any of the solid matter held in suspension from adhering to the sides of the pipes, which was the great defect of the old rough built stone sewers.

There has long been a difference of opinion among sanitary engineers as to the extent to which the pipe system of sewerage could be carried. The advocates for their exclusive use contend that they should be adopted for main outlets as well as for branches and separate streets, and fireclay pipes are now made as large as from 36 to 40 inches in diameter. In my opinion the proper limit of size is 18 inches:—when they exceed this in diameter they are quite as costly as brick built sewers, and they lose in strength as well as in scouring power as the diameter increases. They also lose the advantage that the egg-shaped sewer has when the flow of water or sewage is small, being flatter in the bottom when the radius of curvature exceeds 9 inches. In all well considered drainage systems (when the engineer is not led away with a hobby for any special system), it is the practice to adopt brick built sewers of the egg shape form for the main outlets and chief intercepting sewers, and to use fireclay pipes for every other part of the drainage area.

The main outlet for a drainage scheme frequently becomes a

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most important question to settle. All towns placed upon the sea shore or on tidal rivers naturally have their outlets fixed at the lowest point that can be found, which is often eight to ten feet below the level of high water, this being necessary to drain the cellars of houses built on streets only a few feet above the tide. Tide-locking of the sewers is the inevitable result. When this level has to be adopted, it is no doubt an objection, incurring the risk of the sewers getting silted up, while the gases are also apt to be driven back into the houses, unless great care is taken in providing ventilation.

Inland cities and towns are generally near a river or stream into which the sewage is thrown; but whether situated on the sea shore, tidal rivers, or inland streams, the general practice has been to place the mouths of the outlets so that the sewage shall be discharged into a body of running water. "At the early period in the history of "sanitary reform the pioneers of the science were so impressed with "the enormity of the evils arising from retaining decomposing "matter in the vicinity of our dwellings that they were led to look "upon sewage as a nuisance to be got rid of as quickly as possible, "so they poured it into the nearest stream or water course, in the hope "that that stream would bear it harmlessly to the ocean, where it "would be entombed for ever out of sight."* The evils likely to arise from this practice will be referred to under the second head of this paper.

Another important question is the proper dimensions of outlets, intercepting sewers, and branch pipes. The *data* are now so reliable that there is not much difficulty in fixing the maximum area for each sewer. There is, first, the dry weather, or sewage-proper flow. After many experiments and observations it has been ascertained that the quantity of sewage flowing from a given population varies but little from the water-supply provided. Thus the gallons of water per head supplied to the inhabitants, determine the number of cubic feet of sewage that flows in a street having a given number of houses. It has hitherto been also the practice to provide for the rain-fall—a matter of considerable difficulty. Observations have proved that the quantity of water flowing off by the sewers is much less than falls on the ground—on an average about one-half—and therefore $\frac{1}{4}$-inch per twenty-four hours falling over the

* Purification and Utilization of Sewage, by Baldwin Latham, C.E., London, 1867.

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whole drainage area has been adopted as the reasonable maximum that should be provided for in the sewers. There are rare occasions when the rain-fall is greater, but to provide for such exceptional cases would entail great outlay, and render the sewers and pipes too large for ordinary purposes.

There is now a growing feeling in some towns to adopt what is called the "Separate System." This is to allow only sewage to enter the pipes, the rain water being permitted to escape by open channels, or to pass through the old street drains. The advantage of this plan is its cheapness, smaller drains sufficing. Another gain, in the case of towns so situated that the sewage requires to be pumped before an outlet can be got for it, is that less steam power is needed, there being a much smaller volume of fluid matter to lift when the rain water is excluded. The sewage is also more valuable as a manure, being less diluted. In towns where the outlets are tide-locked there is also less flooding of cellars during heavy storms, as the drains required for storm floods can be kept at a higher level than the sewers. This system can, however, only be applied to small towns. In large cities it would involve a double set of sewers, as the rain water could not be got rid of otherwise.

For ventilating the sewers various methods are adopted:—they are connected by flues with the lofty chimneys of factories; the down spouts of high houses, not near to windows, are carried untrapped into sewers, and ventilating chimneys are carried up from the sewers above the highest neighbouring buildings and furnished with Archimedean screw ventilators or pumps kept constantly in motion by the air. But what are most in favour at present are the Charcoal Filters, adopted, I believe,on the authority of Dr. Letheby, who says that "there is in charcoal a perfect means of arresting and oxidizing all the noxious compounds contained in these gases."

There are difficulties to be met with in all the systems enumerated. Factory chimneys cannot be had in sufficient nnmbers to fit every sewer, and sometimes the draught is so great as to open the valves of the side drains. The same difficulty applies to ventilating chimneys, and they are also costly. Down spouts carry the gases too near the attic windows of houses, and foul air is apt to be blown down with certain states of the wind into the houses through open windows, &c. There is a still more serious evil than this during wet weather. When the down spouts are full of water descending from

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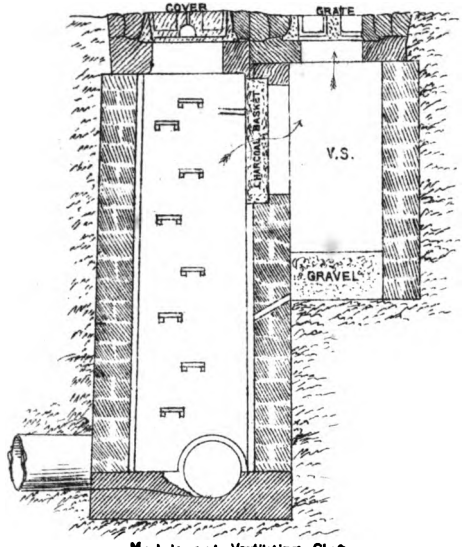

Manhole and Ventilating Shaft.

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the houses, the ascending gases are driven back into the sewers by the force of the stream, and are thus either bottled up in the sewers or escape through branch drains into the houses. The objection to the charcoal ventilator is the difficulty of keeping the charcoal dry. To remedy this the shafts are connected with the manholes along the course of the main sewer. In the side walls connecting the manholes and ventilating shafts, traps filled with finely broken vegetable charcoal are placed through which the gases must pass before they escape into the street—as shown on the drawing. The object of thus placing the trap is to keep the charcoal as dry as possible, as it is alleged that the moment it becomes saturated with water the condensed oxygen, which is the active agent in neutralizing and destroying the noxious effects of sewer air, is driven out, and the charcoal becomes inoperative. If kept dry, it is probable that the renewal need not be oftener than once a-year.

At Montrose it is proposed to erect upright pipes as near as possible to the summit levels of all inclines, placing these pipes against garden walls, gables of houses, or in other convenient situations. At the bottom of the pipes, widened out for the purpose, the charcoal trays will be placed and kept dry by a cap similar to the finish of an ordinary ventilator. But what is more desirable is, if possible, to *prevent* the generation of noxious gases by a rapid discharge of the sewage through the pipes and its purification as soon after leaving the outlet as possible.

DRY EARTH SYSTEM.

This method has been strongly advocated by several high authorities; and in towns, such as Manchester, where the water supply is small, and cannot be increased, the authorities have been compelled to adopt it to a certain extent so as to economize the water. The system can also be adopted with advantage in villages where no water supply exists, and in factories, barracks, lunatic asylums, and wherever rigid rules can be enforced.

The principle is to prevent all excremental matter from getting access to the sewers, and to render it innocuous by mixing it with earth or charcoal, removing the whole at stated periods to a distance in the form of Police Manure. This system could not be applied to large cities except on a limited scale. There would be such a vast mass of earth or charcoal required for such a city

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as London, or even Liverpool, as to render the plan impracticable. Besides, drainage schemes or the "water carriage system" would still be necessary for removing refuse from wash houses, pantries, factories, &c.; and to introduce the dry earth system into towns having an ample supply of water would only complicate matters, as one system must always be more easily managed than two.

At Birmingham and other inland cities of England where the authorities cannot obtain sufficient land for absorbing the whole sewage either by irrigation or filtration, they have had to resort to a system of excluding from the sewers as much excremental matter, both solid and liquid, as possible.

The system in process of development consists in excluding from the sewers all refuse from slaughter houses, cattle markets, public urinals, cowhouses, and stables. It involves a weekly collection, under the strictest supervision, of all offensive matter from courts, streets, privies, &c. A rate on occupiers of houses in respect of water closets is also imposed, so as to limit their number, and the quantity of sewage to be purified at the outlets is thus reduced as much as possible.

The Dry Earth System, invented by the Rev. Henry Moule of Fordingham, who still ably advocates its adoption, is gradually gaining ground throughout the country, and in isolated establishments and villages too small for systematic sewerage, and unprovided with an adequate supply of water, the system may be advantageously adopted In manufacturing towns also, where a necessity of economising water exists, it has been used to advantage in manufactories and other public works.

WATER CARRIAGE SYSTEM.

This system, now generally adopted, has the effect of depositing the sewage of towns, not placed upon the sea shore, into rivers and streams. The consequence is that many of these are so impure from the polluting matter thrown into their channels, that the Legislature have been compelled to interfere so far as to appoint a Royal Commission to enquire into the best means of purifying sewage before it be admissible into any running stream.

After long and careful analysis of the polluting matters falling into rivers, the Commissioners have arrived at the conclusion that a standard of purity must first be established for the admission of

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effluent water from ordinary sewage into rivers. They suggest several standards, four of which apply to sewage proper, viz.:—

1st. Any liquid containing *in suspension* more than three parts by weight of dry mineral matter, or one part of dry organic matter, in 100,000 parts of the liquid shall be deemed polluting and inadmissible into any stream.

2nd. Any liquid containing *in solution* more than two parts by weight of organic carbon, or .3 part of organic nitrogen, in 100,000 parts shall also be inadmissible.

3rd. Any liquid which shall exhibit by daylight a distinct colour when a stratum of it one inch deep is placed in a white porcelain or earthenware vessel shall also be inadmissible.

4th. Any liquid which contains *in solution* in 100,000 parts by weight more than two parts of any metal, except calcium, magnesium, potassum, and sodium, shall also be deemed inadmissible.

The Commissioners having thus established standards of purity for the effluent water that ought to be admissible into rivers, the next subject of inquiry was the various methods tried for purifying sewage. These were classified thus :—

1st. Treatment with Chemicals,
2nd. Filtration, and
3rd. Irrigation.

1st. Treatment with Chemicals.

This is generally applied to sewage first conveyed into settling ponds ; for the precipitation of offensive matter held *in suspension*, and absorption by chemical affinity of polluting matter held *in solution*. Dr. Frankland being one of the Royal Commissioners, the patents afterwards named were carefully investigated. Every process known at the date of the inquiry was experimented upon and the effluent water submitted to chemical analysis. The processes examined were—

1st. The Lime Process.
2nd. Sillar's A B C Process.
3rd. Lime and Chloride of Iron.
4th. Sulphate of Alumina.
5th. Holden's Process—Sulphate of Iron, Lime, and Coal Dust.*

The Commissioners admit that all these systems were to a great extent successful in removing polluting organic matter *in suspension ;*

* See Appendix No. 1.

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but as regards the removal of the organic matter *in solution*, allege that treatment by chemicals has hitherto failed.

Avoiding minute details of the analyses, it may be stated generally that the average amount of dissolved organic pollution removed by all the chemical processes named was 28.4 per cent. of Organic Carbon, and 36.6 of Organic Nitrogen—only about one-third of the polluting matter held *in solution*.

With apparently every desire on the part of the Commissioners (with Dr. Frankland as one of their number) to view this treatment favorably, their conclusion in reporting on the A B C system is :—

"It would obviously be rash to set any bounds to the possibility of chemistry. Substances may perhaps be hereafter discovered capable of combining with and rendering insoluble the filthy constituents of our town drainage, but we are compelled to admit that the present resources of this science hold out no hope that the foul matters dissolved in sewage will be precipitated and got rid of by the application of chemicals to the offensive liquid. The chemical affinities of these foul matters are so feeble and the matters themselves are dissolved in such enormous volumes of water that their precipitation is a problem of extreme difficulty." Such is the decision after careful chemical analysis.

The results arrived at by a practical man are even less encouraging.

Mr. Marshall, Engineer to the Board of Health at Tottenham, states that after experimenting on a large scale, he was compelled to report—"That in all the systems known (except that of Dr. Forbes, to be afterwards referred to) the results have been generally the same, viz., the effluent water was more or less bright, but still polluted by the presence of ammoniacal salts in solution, while the deposits were nearly or altogether valueless. The methods are simply precipitants, the consequence has uniformly been that the manure made from sewage was little better than mud." Further experiments made by the River Pollution Commissioners prove that the money value of the suspended matter in sewage is only 1-7th part of that held in solution.

It thus appears that at the date of the reports now quoted (1870 and 71) treatment by chemicals still left the effluent water so impure that it was inadmissable into any stream, and that only the worthless matter held in suspension was precipitated, leaving the more valuable ingredients to run to waste.

Undeterred by the experiments and opinions of the chemists

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and others employed by the Royal Commissioners, several manure companies persevered; but the problem does not yet appear nearer solution as regards the processes above named. The following are the latest results :—

The Native Guano Company at Crossness last year applied the A B C process for three months to a daily flow of 12,000,000 gallons. Their agents state that the effluent water on the whole was good, and that during precipitation and storing of the moist cakes and the final drying in cylinders there was no offensive effluvium. The value of the manure as judged by its chemical composition does not exceed 20s. per ton. The Metropolitan Board of Works, who had the control of the sewage, appear to have been so dissatisfied with the operations that after three months they refused to allow more sewage to be operated upon, and compelled the Company to remove their works after about £20,000 had been spent on buildings and experiments.

2nd. Filtration.

The Purification of water by filtration has long been practised, and, if the proper materials are used, it is the most effective means, even in the case of sewage.

The River Pollution Commissioners having conducted a lengthened series of experiments by filtering sewage through various materials, called attention to the process. By filtration, as distinguished from irrigation, is meant the passing of a given quantity of sewage through as few acres as will cleanse it, securing permanent efficiency and freedom from miasmatic evils by having a series of beds to permit periods of rest. Experiments show that for the best results the filtration must be downward as well as intermittent, and the quantity of sewage applied from 56 to 76 gallons per cubic yard in 24 hours.

If the materials used are sand and chalk the amount of soluble matter removed is from 84 to 86 per cent. of the Organic Carbon, and from 94 to 96 per cent. of the Organic Nitrogen. When applied to ordinary soil the percentage is rather less.

The Commissioners, in summing up their results, state as follows :—"These experiments upon the filtration of sewage through various materials leave no doubt that this liquid can be effectually purified by such processes, and that probably any variety of porous and finely divided soil may be employed for this purpose. Our experiments also appear to show that if the soil be not over dosed

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with sewage it will retain its efficiency for a long, if not for an unlimited period of time, and its pores will not become clogged up. With a properly constituted soil, well and deeply drained, nothing more would be necessary than to level the surface and to divide it into equal plots, each of which in succession would then receive the sewage for six hours. In this way the sewage of a water closet town of 10,000 inhabitants could at a very moderate estimate be cleansed upon 5 acres of land, if the latter were well drained to a depth of 6 feet.".

The objections to the general adoption of this system are :—

1st. It would be entirely unremunerative.

2nd. The whole of the manurial ingredients would be wasted.

3rd. The collection of solid fæcal matters upon the surface of soil without any vegetation would probably give rise to a formidable nuisance, especially in hot weather.

4th. The land would also be wasted.

The foregoing remarks on filtration refer merely to experiments initiated in the Chemical Laboratory of the Commissioners to test the theory.

Encouraged by the results, Mr. B. Denton, appointed by the Court of Chancery to devise a scheme for purifying the sewage at Merthyr in Wales, tried the system. He laid out the land in narrow ridges and furrows, as a Scotch farmer prepares for Swedes. The sewage is absorbed by the sides of the ridges as well as by the bottom of the furrows.

The sewage of the district, averaging 600,000 gallons daily (the population being 50,000), is passed through 20 acres of land, formed into a series of four filtering areas of about equal size. The whole is drained at a depth of from six feet to over seven feet, thus securing about two cubic yards of filtering material for each square yard of surface. On the ridges vegetables of various sorts have been grown.

The River Pollution Commissioners after examination say :—

"None of the nuisances have arisen of which in our report (1870) we expressed some fear if extensive filter beds were made for the treatment of the sewage of any considerable town. The works were designed by Mr. B. Denton expressly for the purpose of realising on a large scale the results of that process of intermittent filtration which has been devised and investigated in the Laboratory of this Commission, and we have twice inspected them, and on both occasions have found the effluent water purified to an extent much beyond that required by the standards of purity suggested by us ;

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those below which refuse liquids should not be permitted to enter rivers."

3rd. Irrigation.

By Irrigation as distinguished from Filtration is meant the application of sewage without super-saturating the soil, having in view the production of a maximum growth of vegetation from a given quantity of sewage, on land naturally absorbent, or rendered so by drainage.

The great preponderance of opinion among experienced engineers and agriculturists is in favor of this system. Objections have been raised to the application of raw sewage to land under certain circumstances, on account of the smell sometimes produced, and the immediate effect on some forms of vegetation. But the evidence of medical gentlemen in Edinburgh, where the sewage is largely applied, and that by the rudest form of carriers, shews that health in the immediate neighbourhood is not materially affected by the emanations. With proper under-drainage, to carry off the effluent water, and thus prevent flooding or rather swamping of the land, the best results are obtained, and no nuisance is created. Under-drainage is, in short, the first requisite. "It cannot be necessary to say a word to prove that land already suffering from wetness, with an average rainfall (such as we have in this country) of nearly 30 inches in 12 months, and an occasional downfall amounting frequently to 2 or 3 inches in one day, will be benefited by under-drainage when it receives on its surface liquid sewage reaching in quantity 4 or 5 times those respective amounts. When drainage is wanted at all, it is obvious that it must be required under such circumstances."*

Before applying sewage for irrigation there are two important points to be considered; the area of land available along the course of the conduit or sewer, and the outfall for the unused or surplus sewage.

The most perfect system would be to sell or use all that was possible on the way to the outfall, and to have the outfall itself on worthless or barren sands belonging to the corporation or company to whom the sewage had been conceded. When there was no market for the sewage in transitu, it could thus be used for the fertilisation of land at the outfall. If it should be found to pay better not to

* "The Sewage Question," by J. Bailey Denton, M. Ins. C. E., London, 1871.

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sell any on the way then the whole could be thus used.

The next question is what quantity of sewage ought to be applied to the land. On this point there is a wide diversity of opinion, and, I believe, no fixed rule can be applied.

The composition of the sewage varies in different towns, and also the purifying powers of the land. But while there are no exact data as to the minimum quantity that may be used, it appears from experiments made at Rugby that the maximum can be arrived at approximately. Where the unmanured land there produced only 9 tons of grass per acre, 22 tons were obtained by using 3000 tons of sewage, 30 tons by using 6000 tons, and 32 tons by using 9000 tons. By far the greatest result was thus got from the application of the first 3000 tons, and while it might be a question whether it would be worth while to pay for the second 3000 tons, it would clearly be unprofitable to pay for a third. A fairly remunerative maximum has been taken at about 5000 tons per acre, equal to one acre of land for about 100 people.*

That sewage applied to irrigate land enriches it is a fact now so well known that it need not be enlarged on. The great question is, Can it be conducted so as to become a commercial success?

For many years the most sanguine notions were entertained as to the great profits to be made by irrigation with town sewage, based chiefly on the returns given of Craigentinny Farm, near Edinburgh. Unfortunately, as the returns I will now quote show, there is a want of reliable results in other places, where the system has been adopted. The following table, compiled from information sent me by the engineers in charge of irrigation works, and also from other reliable sources, will show where the system is in operation, and the results likely to be derived by its proper application:—

* From an able paper read by Geo. Robertson, Esq., C.E., before the Royal Society of Arts, Edinburgh.

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LOCALITIES WHERE IRRIGATION IS PURSUED.

Gravitation or Pumping.	PLACE.	No. of Persons whose Sewage is applied.	Average Irrigated.	Cost of Works.	Annual Income.	Annual Expenses, including Rent.	REMARKS.
G.	EDINBURGH, ...	80,000	230	£5000	£5760 0 0	.....	Cost of Works for 200 Acres.
P.	BARKING, ...	.....	200	.....	.....	.....	Return for Grass 5/ per person contributing Sewage.
G.	ALDERSHOTT, ...	7,000	80	.....	1200 0 0	.....	Return 3/4 per head (estimated).
P.	CARLISLE, ...	21,500	100	.....	.....	.....	£5 per annum paid for Sewage Land let by Tenant at £8 ℔ acre; value before being irrigated, about £4 ℔ acre.
G.	PENRITH, ...	8,000	80	.....	.....	.....	
G.	RUGBY, ...	8,000	65	5000	544 16 8	£458 8 5	Rent, £4 10/ ℔ acre.
P.	BANBURY, ...	11,000	136	5000	1280 7 10	1190 13 1	Rent, £4 10/ ℔ acre.
P.	WARWICK, ...	11,000	100	.....	2071 0 0	1900 0 0	
P.	WORTHING, ...	8,000	100	.....	1807 4 9	1045 6 9	
P.	BEDFORD, ...	15,000	55	.....	647 10 4	580 4 2	To be increased to 200 Acres; Rent, 90/ ℔ acre.
G.	NORWOOD, ...	4,000	30	.....	741 0 6	592 14 9	Return about 3/9 per head.
G.	CROYDON, ...	30,000 to 40,000	260	.....	.....	.....	Tenant pays Rent, and 20/ per acre for Sewage.
G.	WORKING, ...	1,000	2	.....	.....	.....	

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This table shows that with proper management there is the probability of a fair return for the money invested on Irrigation; but success depends almost entirely upon the management. There are also other difficulties to encounter in most towns before the system can be adopted, which I shall yet refer to.

The Effect of Irrigation upon the Sewage.

The water flowing off the land after Irrigation has been tested by the River Pollution Commissioners at nearly every place where the system was applied. Even at Edinburgh, where the ground is much overdosed, and the cleaning of the sewage does not receive even secondary consideration, and where the operations are carried on in the most slovenly manner, the polluting matter removed is—Of the Organic Carbon 45.3 per cent., and of the Organic Nitrogen 81.1 per cent. The average of all the experiments at the various places is—

Of the Organic Carbon . . . . . 68.5 per cent. removed.
Of the Organic Nitrogen . . . . 81.7 per cent. removed.

The following are Dr. Frankland's remarks in giving the results of his various experiments :—

"Thus in round numbers it may be said that, on the average, the processes of downward filtration and irrigation remove from the soluble constituents of sewage (as measured by organic carbon and nitrogen) twice as much polluting matter as that got rid of by the processes of chemical treatment and of upward filtration. Looking only to the purity of effluent water, it would be difficult to decide between downward filtration on the one hand and irrigation on the other; but there are obvious reasons why the latter must in all but very rare and exceptional instances be preferred on economical grounds."

It thus appears that the application of sewage for the purpose of irrigation, in the first place purifies the effluent water, so that it is admissable into any running stream. 2nd. The manurial value of the sewage is not lost, but, on the contrary, better results commercially have been obtained from it than from any of the other systems; and 3rd, looking at the question in a wider sense, we see barren and worthless land such as the sandhills of Craigentinny and the shingly heath-covered downs of Aldershott converted into luxuriously fertile fields, producing crops of grass and vegetables exceeding those of richly cultivated districts.

In the foregoing notes I have endeavoured to lay before you

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concisely the position of the sewage question down to the latest published reports. It is satisfactory that so many minds are directed to the subject, and so many different modes of treatment tried and experimented upon.

The results are being watched and carefully tested by a committee appointed by the British Association, as well as by the Royal Commissioners, and doubtless progress will eventually be made in solving this difficult question. I shall now endeavour to sum up the progress made to this time.

1st. The various methods of precipitating the solid matters in sewage by chemical treatment have not been successful. At least 5-6ths of the valuable matters contained in sewage are not capable of being precipitated by any known chemical process.

2nd. The dry earth treatment for collecting the sewage does not as yet appear capable of extension to large towns. It is also doubtful if civilization will permit of a departure from the water closet system, by which the sewage must necessarily be carried off in a fluid state. Although it would be desirable to obtain the sewage in a more concentrated form by separating house from surface drainage (the system I have recommended for Montrose, where there are special advantages for applying the separate system), the general impression is that we must accept the present state of matters, as it is not likely we shall ever have the streets of large cities complicated with a double system of sewerage, especially after large sums of money have been expended in perfecting present arrangements.*

3rd. Downward Filtration is capable of extracting a larger percentage of matter, held both in suspension and solution, than any other process. But as the fertilizing elements in sewage are wasted in filtration, the system ought to be connected with Irrigation, so that when at certain stages in the growth of the grasses and plants it would be inopportune or detrimental to flood the irrigated lands, the sewage could be turned on to the filtering beds, and the effluent water thereby purified sufficiently to be allowed to enter any running stream.

It is only fair to state that this combination is the ultimate aim of Mr. Baillie Denton, at Merthyr, in Wales. Besides the loss of the manurial value of the sewage by adopting Filtration alone on a large scale, the land on which it is thrown in such large quantities

* The same views are expressed in Geo. Robertson's paper read before the Royal Scottish Society of Arts, Edinburgh.

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would ultimately, in all probability, become useless. With Filtration alone there would thus be double waste.

4th. The results from Irrigation are not altogether satisfactory. No doubt the attempts made at Edinburgh, Croydon, Paris, and one or two other towns have been commercially successful, but they are exceptions.

Besides the economical consideration, which turns mainly on management, there is the important consideration that sewage thus applied either fertilises the land more or less permanently, or at least stimulates the growth of plants—in some cases to an amazing extent, even on land previously worthless; thus adding largely to the food supply of the country. For this reason alone the system should be applied to the utmost extent possible.

There are however many difficulties, some of them almost insurmountable, in carrying out Irrigation, especially in connection with large cities.

One of the first that presents itself is the level of the outfall. It rarely happens that there is land available without first lifting the sewage, wholly or partially, to a higher level; and this operation is generally a costly one. Another difficulty is the acquisition of the necessary land.

To begin with London, the population of which is now between 3,000,000 and 4,000,000. Assuming one acre for 100 persons, 30,000 to 40,000 acres would be required, without allowing for future increase. As there is no land to this extent commanded by the outfall at Barking, it is proposed to pump up the whole of the sewage from this outfall to an extra height of about 32 feet, and carry a conduit of about 10 feet in diameter across the County of Essex to Maplin Sands, on the sea shore, 44 miles from the present outlet. It is intended to reclaim 12,000 acres from the sea, on which the surplus sewage may be thrown; the promoters of the scheme trusting that the farmers along the route of the conduit will buy part of the sewage, thus brought to their very doors.

With this view, the route of the conduit has been so chosen as to command about 80,000 acres more. The estimated cost of the undertaking is £2,100,000. The pumping power required to lift the sewage is equal to 550 horse. Parliamentary authority was obtained to carry out the works, and a concession of the sewage granted to a company about eight years ago, but the monetary crash of 1866 interfered, and nothing has yet been done.

Glasgow is another instance.

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The River Clyde is the only outlet for the sewage of this city, now containing over 500,000 inhabitants. The river is so polluted as to be only a foul mass of sewage; and the city authorities, about eight years ago, impressed with the evils likely to result, employed the most experienced men to devise a plan for purifying it. Surveys and schemes of all descriptions by local engineers and chemists were submitted to Mr. Bateman and Sir Joseph Bazalgette of London. After long and careful inquiry these gentlemen concluded that an Irrigation scheme was the best, and that not less than 9,000 acres would be required, allowing for increase in population.

The whole valley of the Clyde below Glasgow was examined, and it was found that 7,000 acres was the utmost extent available. They therefore turned their attention to other points, and eventually fixed upon the Ayrshire coast between Irvine and Troon, where there is a long range of sand hills and links comparatively useless.

To carry the sewage to this point involves lifting it at Glasgow by pumping, and carrying it 25 to 30 miles by a tunnel, at an estimated cost of £1,250,000.

In this case there is the difficulty that there are towns in the immediate vicinity of the proposed Irrigation lands which have a prior claim to their use. It is therefore doubtful if powers could be got to acquire these lands for the use of Glasgow until Irvine, Ardrossan, and Kilmarnock have found means of disposing of their sewage.

Notwithstanding the facilities that such cities as London and Glasgow have for raising money, nothing has been done, as yet, to carry either of these schemes into operation.

Birmingham may be cited as another example where serious difficulties have arisen. A Committee of the Borough Authorities after receiving the best reports procurable were advised by Mr. Hope, the highest authority on sewage farming, that less than 10,000 acres would not suffice for the purpose of utilizing the sewage of the city.

The cost of preparing this vast tract of country for its reception, by levelling and deep drainage, would probably amount to £25 per acre, or a total of £250,000, independently of the purchase of the land, and the construction of the necessary tanks, and the conduits. Taking into account the uncertainty and difficulty of utilization on a large scale, and acting in accordance with the results of their own inquiries and the best advice, the Committee

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could not recommend the adoption by the Council of an Irrigation scheme, but suggested Filtration.*

But to come nearer home.

The Police Commissioners of this city a few years ago entered into an arrangement for disposing of a portion of the sewage for the Irrigation of about 45 acres of land on Spital Estate, belonging to the late Lady Bruce, now to Mrs. Knight Erskine. The terms are that the town should supply sewage, from the sewer in King Street Road, in such quantities as might be required, not exceeding 5000 tons per acre, at an annual rent of £5 per acre. All who have seen the lands and terms of agreement, and are competent to express an opinion, agree that a better method of procedure could not be followed. The city gets rid of part of the sewage, which is utilized, and a return—which we may assume to be a fair one—secured without any risk. The land is situated on the north-east side of the city—the prevailing winds being from the south-west. It is understood that the owner of the ground has reason to be satisfied with the result of the experiment thus made in irrigation farming—even with the disadvantage of having incurred a large outlay in levelling the land and constructing carriers, drains, &c. I have never heard anyone complain of this irrigated ground being a nuisance.

Closely adjoining the irrigated lands there is an area of about 250 acres, of which 140 are arable and 110 links. Of the links, 60 acres are covered at high water of spring tides. The proximity of this land to the town, the configuration of its surface, and the quality of its soil, render the arable part suitable for growing market garden produce. The links portion (now all but useless) is admirably adapted for grass. All that is required is an embankment along the river Don, with a self-acting sluice to exclude the tide, and subsoil drainage. The quantity of grass grown upon the part already irrigated shows how productive this waste ground might become. Attempts have been made to acquire power over this land, especially the links portion. The first difficulty is disputed ownership. The city authorities allege it belongs to the town, while the agents for Mr. Hay of Seaton assert that the greater portion is his property. It is more than likely the Court of Session would have to decide. The next and greatest difficulty is the right of the public over this land as recreation ground.

In its present state it receives the sewage from Spital and Old Aberdeen, the whole of which floats up and down twice in every 24

* From Report published by the Birmingham Town Council.

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hours over the tidal area, and the stream which flows down the middle is as foul as any sewer in the city. The greater part of the 60 acres covered by the tide is in consequence all but inaccessible for recreation purposes.

The Town Council proposed to shut out the tide, drain the low flat lands to a depth of 4 to 5 feet, and throw sewage over it during low water. The sewage would thus be purified, and might either pass off by an open channel, or the whole stream might be covered up, leaving the effluent water to ebb and flow inside the sewer thus formed, as in the main outlet into the river Dee at Abercrombie's Jetty.

It was also contemplated to level the west or land face of the sand hills (which are now also all but inaccessible from their undulation), as has been done between Footdee Village and the bathing machines, irrigate the surface until the grasses got firmly rooted, and ultimately open it to the public. This would have secured a green slope, and a space at the top suitable for a carriage drive, extending between the mouths of the Dee and Don, forming a marine parade, two miles in length, by about 20 yards in breadth, which for purposes of recreation could scarcely be surpassed. The flat low-lying ground adjoining, instead of being at times covered with water as at present, unsightly and otherwise offensive, would then be entirely covered with grass. The cost was estimated at £9700, and nearly 80 acres would be reclaimed. It is no doubt proper that the rights of the citizens should be most jealously guarded from any encroachment, but in this case it could scarcely be called an encroachment, as the land that was meant to be retained for irrigation is that now covered with the tide, and seldom available for recreation. It was, however, found to be impossible at the time the scheme was proposed to reconcile all parties to the proposal, or to prevail on them to withdraw opposition. The Town Council would have had a Parliamentary contest, but the recent example of Montrose, where powers were desired to dispose of a portion of the Links, showed the difficulty of obtaining such compulsory powers, even for a desirable purpose. The proprietors of the arable lands also threatened opposition, so that the whole scheme of extending the area for irrigation had to be abandoned. The Council afterwards considered the Murcar Links as the only other ground available. Of these there can be irrigated 250 acres by gravitation, and 100 by pumping the sewage to a height of from 15 to 50 feet. The cost of works to convey the sewage from King

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Street, including draining and levelling, was estimated at £18,000, which, at 4 per cent. interest, amounted to ... ... £720 yearly.

Rent of Land	... 1050	do.
Expense of Management ...	... 850	do.
Total probable yearly expense	£2620	

for which the Town Council would be responsible. The returns were estimated at £4500 yearly, showing a probable profit of £1880. The Town Council cannot be blamed for hesitating to undertake such a responsibility, considering the absence of reliable results from irrigation at other towns ; especially as the quantity of land at Murcar falls far short of what is required for the entire sewage, the total area needed for Aberdeen being about 1200 acres.

It thus appears that the inference to be drawn from this paper is that the sewage question has come to a dead-lock, which is in reality the state of the case. The quotation below is from an article in the *Times* :—"The sanitary dead-lock is sufficiently perplexing. One authority obliging the distracted members of Town Councils to drain *somewhere*, another interdicting the drains from flowing almost *anywhere*, but none telling them *where* or *how* to dispose of their refuse."

The probable ultimate settlement of the question appears to be, that as no single system can be devised applicable to every case, various modes must be adopted to suit the specialities of different localities :—

1st.—Irrigation, accompanied with Filtration, wherever there is land to be had, or farmers willing to pay for the sewage as it passes.

The great question of the food supply of the country demands that more facility be given for the extension of this system, and if the Legislature should enact stringent laws prohibiting the pollution of rivers, compulsory powers must be given to Corporations to acquire land for irrigation.

2nd.—The Dry Earth or Charcoal Process for utilizing the sewage of villages, isolated public works, lunatic asylums, camps, &c.

3rd.—Further researches are still required into the merits of treatment by chemicals.

It has been sufficiently proved that by passing sewage, however impure, through earth and gravel 6 feet in depth, the effluent water is sufficiently purified to be admissible into any river. There must,

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therefore, be some chemical change during this process. It cannot be altogether a mechanical effect. Is there no Farraday or Liebig among the many eminent living chemists to wrest the secret from nature and explain how sewage is purified so rapidly? When this is discovered the problem, in my opinion, is solved.

Whenever Irrigation or the Dry Earth System cannot be applied to advantage, resort could then be had to chemical treatment, so as to send off the effluent water in such a state as to comply with the standards of purity suggested by the River Pollution Commissioners. Such a process would fit better into works already executed than any other, as it could be applied without alteration of existing outlets, whether from towns or from public works.

Any retention of the nitrogen, &c., held in solution would give additional value to the mass precipitate, if it were not in such a state as that it could be conveyed by rail or otherwise for the use of farmers. If this process could be applied, not only to town sewage but to all polluting matter from mining and manufacturing works, we should then hope to see all our rivers and streams restored to their original purity; and the matter that so disfigures and pollutes them placed where it would fertilize the land and add to the wealth and prosperity of the country.

APPENDIX No. I.

RETURN SHOWING THE EFFECTS OF TOWN DRAINAGE ON HEALTH.

ABERDEEN—TOTAL DEATHS.

Showing the Effects of the New Water Supply and Drainage on the Health of the City.

Year.	Before New Water Supply. Deaths.	Year.	After New Water Supply. Deaths.
1861	1,782	1867	1,824
1862	1,924	1868	2,029
1863	1,749	1869	1,787
1864	2,130	1870	1,924
1865	1,978	1871	1,992
1866	2,319	1872	2,119
	6)11,882		6)11,685
Average Yearly Mortality ...	1,980	Average Yearly Mortality ...	1,949
Average Population (say) ...	78,000	Average Population (say) ...	85,000
Per Cent. of Deaths to Population	2·538	Per Cent. of Deaths to Population	2·293

NOTE.—The years in column 2 represent very fairly the new sewerage system as well as water supply. J. W.

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WHAT THE DRAINAGE OF PERTH HAS EFFECTED.

From the Perthshire Constitutional, Sept., 1871.

The slow progress of the population of Perth is seen in the figures giving the last three censuses, viz. :—

	1851.	1861.	1871.
Population,	23,835	26,094	26,377

TABLE I.

Shows the mortality of the City of Perth for the last decennial period, viz., 1861—1870, both inclusive ; also the comparative deaths at the two quinquennial periods respectively, thus :—

Years.	Deaths.	Quinquennial Number of Deaths.
1861	667	
1862	618	
1863	652	3537
1864	871	
1865	729	
1866	613	
1867	569	
1868	626	3143
1869	694	
1870	641	

The five years 1861-65 give.....3537 deaths.
Do. 1866-70 give.....3143 do.

In favour of the latter period.....394

This shows a saving of human life very great—exceeding 78 persons per annum—a proud triumph we regard it, and a happy reward for all our sanitary exertions. Along with this must have followed a vast amount of general health and comfort, with marked economy and saving, especially to Parochial Boards.

In the above table it is worthy of remark that the two lowest years in mortality appear in the latter quinquennial period, viz., in 1867, when the deaths were as few as 569 ; and in 1866, when the deaths were 613. In the whole of the latter period no year having a high ratio of mortality appears ; and all this in the face of an increasing population.

But to show the importance of this decrease of death-rate more strongly, and that it is not a mere incidental thing, we look back to a previous decennial period and make the same favourable comparison.

TABLE II.,

Shows the mortality of the City of Perth during the decennial period,

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viz., 1851-1860, with the two quinquennial periods respectively :—

Years.	Deaths.	Quinquennial Number of Deaths.	Years.	Deaths.	Quinquennial Number of Deaths.
1851	528		1856	539	
1852	630		1857	784	
1853	539	3176	1858	665	3232
1854	835		1859	560	
1855	644		1860	664	

We see that the latter five years of last decennial period is somewhat less than any of the above, and yet the population was several thousands more.

Not less satisfactory is the following table, showing the decrease of epidemics in fatality during the last five years.

TABLE III.,

Showing the number of deaths in the City of Perth from zymotic or epidemic and contagious fevers during the two last quinquennial periods :—

Years.	Deaths from Epidemics.	
1861	168	
1862	151	
1863	155	954
1864	263	
1865	217	
1866	115	
1867	72	
1868	126	672
1869	216	
1870	143	

Period 1861-65.....954 deaths from epidemics.
Do. 1866-70.....672 do.
Deaths in favour of the latter five years, 282.

It therefore appears that the diminished mortality is chiefly due to the diminution of epidemic deaths.

Looking at the above table, it is notable that the diminished mortality begins in 1866, in which year the most important parts of our drainage, the side drains, were introduced; at which time also the worst lanes and closes were also drained into the great street sewers.

EXTRACT FROM REPORT OF THE HEALTH OFFICER OF THE CITY AND COUNTY OF CHICAGO, FOR THE YEAR ENDING JUNE 30TH, 1873.

For the years prior to the construction of sewers in Chicago—from 1849 to 1855—the death-rate was nearly 49 per thousand, or larger than any other city in the United States. In the succeeding six years 54 miles of sewers were constructed, and the rate fell to 23 per thousand. For a third period of five years only 30 miles of sewers were constructed, while the population very greatly increased,

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and the rate increased to nearly 26 per thousand, and finally, in a fourth period, the miles of sewers constructed being 80, the rate again fell to about 23 per thousand.

APPENDIX No. II.

DESCRIPTION OF VARIOUS PROCESSES ENUMERATED UNDER "TREATMENT WITH CHEMICALS."

1st, The *Lime Process* consists in mixing a certain quantity of milk of lime with sewage as it arrives at the works, then subjecting the mixture to violent agitation by means of machinery, and allowing it afterwards to pass into large subsiding tanks.

In these reservoirs the mud composed of the suspended matter and lime is deposited, and the cleaned water flows into the nearest water-course.

2nd, *Sillar's, or the "A.B.C." Process.*—The materials used in the operation are alum, blood, clay, magnesia, burnt clay, &c.

These substances are mixed together and added to the sewage to be purified until a further addition produces no further precipitate.

The greater part of the impurities are immediately separated in the form of large flakes, which rapidly fall to the bottom. The supernatant water, clear and inodorous, or nearly so, is then allowed to flow into a river. The sediment is found to possess the power of precipitating a further quantity of sewage; it is therefore taken from the tank and mixed with fresh sewage, the sediment being allowed to subside in the same way as before. The sediment may be used five or six times over in this way. When it has lost its precipitating power, it is removed from the tank and allowed to dry; when partially dry, a small quantity of acid may be mixed with it. When dried, the sediment is a valuable manure.

3rd, *Lime and Chloride of Iron Treatment.*—Each million gallons of sewage is first mixed with 12 bushels of lime, and afterwards with about 6 gallons of chloride of iron (in hot weather more, in cold weather less). The defecated sewage is afterwards submitted to upward filtration through a stratum of calcined iron ore 8 inches thick. The effluent sewage, after a flow of 1½ mile through a culvert, in which it becomes mixed with about one-sixth of its volume of spring water, is discharged in a nearly clear and apparently innocuous condition. Analysis, however, shows that the sewage still contains in solution a large amount of putrescible organic matter. The putrefaction of the disinfected sewage is only delayed, and not ultimately prevented, by this process.

4th, *Treatment with Sulphate of Alumina.*—From 150,000 to 200,000 gallons of sewage are daily treated with 6 cwt. of pulverised clay, to which 120 lbs. of sulphuric acid have been added some days previously. The sewage is made to turn a small water-wheel, which regulates the delivery, from a hopper, of the sulphated clay. Thence it flows into a depositing tank, and afterwards through three coke

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filters. It is evident from the analysis that the effluent water, though much improved, is still not of the degree of purity which would render it admissible without nuisance into a clean river.

5th, *Holden's Process.*—The sewage having been mixed with sulphate of iron, lime, and coal-dust, is passed into a series of subsidence tanks. The effluent water which issues from the last tank is of a yellowish tint, and perfectly transparent. The analysis shows that, whilst this process, like most of those already mentioned, separates the whole of the suspended matters, it not only fails to remove the putrescible organic matters in solution, but actually increases their quantity.

This it does by causing some of the putrescible organic matter in suspension in the original sewage to pass into solution. The effluent water could not, therefore, be admitted into rivers.

Forbes and Price's System for Purifying Sewage by Phosphate of Alumina.—The phosphate of alumina in a natural state is insoluble; it is necessary, therefore, to dissolve it by the application of sulphuric or hydrochloric acid. The samples used at the Tottenham Works had been treated by sulphuric acid, in the proportion of one ton of the natural phosphate to from 12 to 14 cwts. of acid (170 deg. Twaddle). This mixture is allowed to stand for a short time, when it forms a brown paste, having all the appearance of stiff clay, but highly acid in character.

It is next dissolved by suitable machinery in water until reduced to the consistency and appearance of liquid chocolate. It is then ready to be mixed with the sewage.

Tanks.—The sewage about to be treated is received into a tank, or series of tanks, capable of containing two or three hours' delivery of the sewage of the district or town. When the tanks are full, the flow of the sewage is transferred to another set of tanks of the same dimensions, which gives the first set of tanks two hours to effect the work of precipitation.

A third set of tanks ought also to be provided, so that the deposit may be taken out during the time the alternate sets of tanks are in operation.

Mixing the Phosphate with the Sewage.—The phosphate prepared, as already described, is to be run into the sewage and thoroughly mixed with it before it reaches the tanks, in proportions depending on the character of the sewage. If the effluent water is to be used for irrigation, the precipitation which immediately begins is allowed to go on without any additional mixture; but if the effluent water is to be discharged into a stream, or the sea, a quantity of milk of lime, just sufficient to neutralise the acid in the phosphate solution, is run into the tank, to precipitate the phosphates contained in the original mixture. The process of precipitation now proceeds very rapidly, and can be distinctly seen from the sides of the tanks. When the tank is quite full, the next, or No. 2 tank, should be filled; when No. 2 is filled, the sewage is admitted again to No. 1; the precipitation is then found to be complete, and the effluent water is discharged over

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the lip or outlet of the tank in a perfectly clear and pellucid stream.

The water is finally passed through a filter composed of coke, charcoal, or other carbonaceous substance, so as to remove any organic matter remaining in solution.

The filter must be re-oxidised by exposure to the atmosphere, the water being run out and air admitted every twelve hours alternately.

General Scott's System.—The principle of this system is to arrest the flow of the sewage by tanks, the suspended matter being precipitated by means of lime and clay, which are added to the sewage in the sewer previous to its arrival at the tank; the proportion of lime so added being about 10 cwt., and of clay 5 cwt., to 400,000 gallons of sewage. After the sludge has sufficiently accumulated in the tanks it is drawn off, placed in a kiln and burnt, and then ground into cement.

The effluent water passes off very much clarified, and without any offensive smell, but is too impure to be sent into a river and too valuable to be wasted. It is not pretended that the process is capable of purifying the liquid sewage; its object is merely the separation and deodorizing of the sludge, and its ultimate use as fuel in the manufacture of cement. The Committee of the British Association report thus:—"On the whole, this process when perfected promises well as a means of treating one of the difficulties of the sewage question—the disposal of the sludge precipitated from sewage. It appears not only possible to destroy the solid matters by fire, but also to secure some return for their use in the manufacture of cement."

Messrs. Wear & Co.'s Patent.—A process of purification consisting 1st of simple filtration through coarse ashes and charcoal, performed in a large tank called the faecal tank, divided into two compartments. From the chambers of this tank the sewage is passed through wooden screens containing 2 feet of charcoal, into the small chambers which contain about 5 feet 6 inches of rough charcoal, through which the sewage passes to a small tank or well, thus completing the first stage of filtration.

From the tank or well the sewage (after again passing through a perforated screen containing 6 inches of rough charcoal) is conveyed by a 12 inch pipe to the deodorizers. These are three in number, the first with a surface area of 200 square feet, and 5 feet 6 inches of charcoal; the 2nd, with an area of 70 square feet, and 2 feet 6 inches of charcoal of smaller size, and the last is a small box containing 4 feet of fine charcoal. This completes the process, the effluent water being discharged into a well. The practice is to use the spent charcoal from the third deodorizer to the 2nd, from the 2nd to the 1st, and from the 1st to the faecal tank.

The general result of the process is that the suspended matters are removed, and the ammonia and organic nitrogen much reduced in quantity. The effluent water that was experimented upon had a strong smell of sewage.

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January 11, 1876.—DR. ROBERT BEVERIDGE, *President, in the Chair.*

MR. GEORGE CADENHEAD, Procurator-Fiscal, read a paper entitled, "Sketch of the Territorial History of the Burgh of Aberdeen."

Sketch of the Territorial History of the Burgh of Aberdeen.

By MR. GEORGE CADENHEAD, Procurator-Fiscal.

THE design of this Essay is to trace and describe the ancient landmarks and "meaths" and marches of the territories pertaining to Aberdeen as a Royal Burgh; to explain the purposes which the various territorial divisions answered in their day, and to show how they originated. It is not proposed to extend the enquiry to the social, political, or mercantile affairs of our Burghal predecessors, nor to take notice of those lands which have come into the possession of the Burgh in trust for charitable or educational purposes. Very much that is interesting has been, and more remains to be, written on the ancient interests and manners and customs of the people of our Burgh, but there is a distinct and peculiar interest in the enquiry here proposed which will be abundantly sufficient for the narrow space within which it will necessarily be treated.

These ancient territorial divisions are sufficiently well known to enable us to see clearly, even if we had nothing else to guide us, that there had been a system and a plan in their origination; and recent historical and archæological researches have shown us, that over many parts of the earth, where our Aryan races have had their habitations, similar or kindred systems and plans are traceable as to the manner in which they portioned out and used their lands. The noticeable characteristic of these old systems was the holding by communities of definitive tracts of land divided into three sections, viz., 1st, the village or town, in which were the dwelling-houses; 2nd, the arable section, which was devoted to cultivation under certain regulations; and 3rd, the common lands, which were devoted to pasturage and the production of fuel. This is altogether such a system as we should expect to find adopted by communities belonging to a race accustomed to establish its colonies in new and hostile lands; the dwelling-places being grouped closely together for neighbourhood and defence; the arable lands being as near the

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defensible town as possible; and the common pasture land, from which the cattle could be driven in when danger approached, being outside and around the arable land. But if these early races had been possessed with our modern ideas of private property in land, we should have found the arable section at least divided and appropriated by individuals, each doing with his own section as he pleased. Such, however, was not the case. The idea of absolute private right in land, except, perhaps, within the town section, was entirely unknown. Such an idea was excluded, and for long ages rendered impossible by the prevalence of the opposite idea, that the use of the land was a common and joint life-rent right of the community. In accordance with this idea, it appears that, while each family in the town had right to a section of the arable land, all were bound to adhere to a certain routine of cultivation and rotation of crops; that when one part of the arable land was for a time deserted in order to lie fallow, all were obliged to take and cultivate sections in the portion next chosen for cultivation, and there is sufficient reason to believe that periodically, in order to preserve equality of occupation, there were redistributions of the arable sections amongst the families.*

Such is the system which seems to have been inveterate in the habits of the Teutonic races, and as these races are believed to have established a footing in very early times along the north-eastern coasts of Scotland, it will be interesting, but not surprising, to find traces of them in the ancient territorial divisions of the Burgh of Aberdeen.

An enquiry into the origin of the name *Aberdeen*, and into the question as to whether our Royal Burgh or the Old Town is the older, may not be strictly relevant to the design of this Essay, but both questions are sufficiently interesting to excuse their introduction and brief discussion. There is a common but really irrational tendency on the part of citizens of the Royal Burgh to claim for it the credit of being older than the sister city, and of having been the first to bear the name. But all known facts seem to be against the claim. No doubt there have been towns or settlements at the mouths of both rivers at periods remote beyond our ken, and into the seniority of which it would be uninteresting to enquire, even

* "Village Communities in the East and West," by Henry Sumner, Maine. London, 1871.

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if we had the means; but some one of these had, in times more nearly within our reach—viz., after the advent of the Celtic race—come to bear the name of Aberdeen, and that name had ultimately attached itself to a town at the mouth of each river, and we wish to know where the name was originally located.

First then, we cannot without good reason set aside the fact that our earliest information—viz., a Charter by King David in 1134—speaks of the two towns as then bearing respectively the names of Aberdeen and Old Aberdeen, which simply means that at that date our Royal Burgh was regarded as the younger of the two; and historically we have no farther information on the subject.

Secondly, an examination of the name philologically leads to the same conclusion. We have no trace of such a name as *Aberdee* having ever existed; and if it had existed unknown to us, no explanation could be given of how the letter *n* should have been added to the end of it. The River Dee is believed to have derived its name from an ancient Celtic root meaning *God*, and in all probability it had in ancient times, like the Welsh Dee, been regarded for some reason as a sacred stream; but that root gives no suggestion of the name ever having terminated with or having a tendency to assume an *n* for its termination, or of ever having admitted the letter *o* into its composition.

On the other hand, the River Don is supposed to have derived its name from an ancient Celtic word meaning *deep*, wherein the *o* is a prominent sound and the final *n* is a necessity. The earliest mention of Aberdeen also, viz., in a charter of King David's, copied in the Book of Deer, gives the name as *Abberdeon*. The Latin language, as used by lawyers, churchmen, and historians, has tenaciously adhered to *Aberdonia* as the name of both towns, and in later times the name is often given broadly as *Abirdon*.

The fact seems to be that originally the name had been neither *Aberdon* nor *Aberdeen*, but an intermediate sound like *Aberdoon*, and the well-known tendency of the local tongue to change such words as boots, shoon, moon, poor, &c., into *beets*, *sheen*, *meen*, *peer*, &c., had inevitably changed the sound into what we now find it. The community of name thus supposed is not altogether unimportant, since it suggests the idea that, although somewhat scattered, the component parts of both towns had originally gone to form one political community; and this idea is countenanced by some facts to be afterwards adverted to.

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As we know from the Book of Deer that the Christian Church was planted in Buchan as early as the seventh century, we have no reason to doubt that it had been planted in Aberdeen very soon after, if not as soon, or sooner; and the position of the earliest chapels between Dee and Don mouth may serve to indicate to us the places where the population was greatest, and where the aboriginal villages or towns were situated. Beginning at the north side of the district, we learn, on the authority of Mr. Orem, who was Town-Clerk of Old Aberdeen from 1691 to about 1726,* that before 1134, when the Bishop's See was transferred to its present site from Mortlach, Old Aberdeen was a village of four ploughs, that is, with common arable lands extending to about four hundred acres, and had a "little kirk" where the Cathedral now stands, called the Kirk of Kirktown, dedicated to Saint Machar. On the same authority we learn that a little south of the Old Town College stood the parish church of Old Aberdeen, called Saint Mary of the Snow, and a little way south of that a chapel dedicated to Saint Peter, both obliterated and almost forgotten in 1661.

Passing then to Dee mouth we find that of old there had been a chapel at Futtie, which Mr Gordon, Parson of Rothiemay (1661),† says was "a paroshen by itselff," and from the fact of the shore opposite to it being the harbour for boats, nearest to the sea, we may say that it is not unlikely that the community of Futtie was as ancient as any in the neighbourhood. Farther west we come to Saint Catherine's Hill, in the close neighbourhood of which there had been, how anciently we cannot tell, a Royal Palace and a chapel. This locality, as will be afterwards shown, has the appearance of having been also a very ancient centre of population, and, probably, the nucleus of what ultimately became the town and Royal Burgh of Aberdeen. Lastly, the site of Saint Nicholas Parish Church had, probably, been that of one of the primitive churches or chapels. The same Mr. Gordon says that the Old Kirk there "began to be builded by the citizens about the yeir 1060." By that time it is likely that the population had spread pretty thickly towards the

* "A description of the Chanonry, Cathedral, and King's College of Old Aberdeen, in the year 1724 and 1725," by William Orem, Town-Clerk of Old Aberdeen. J. Chalmers & Co., Aberdeen, 1791.

† "A Description of both Towns of Aberdeen," by James Gordon, Parson of Rothiemay. Printed for the Spalding Club, 1842.

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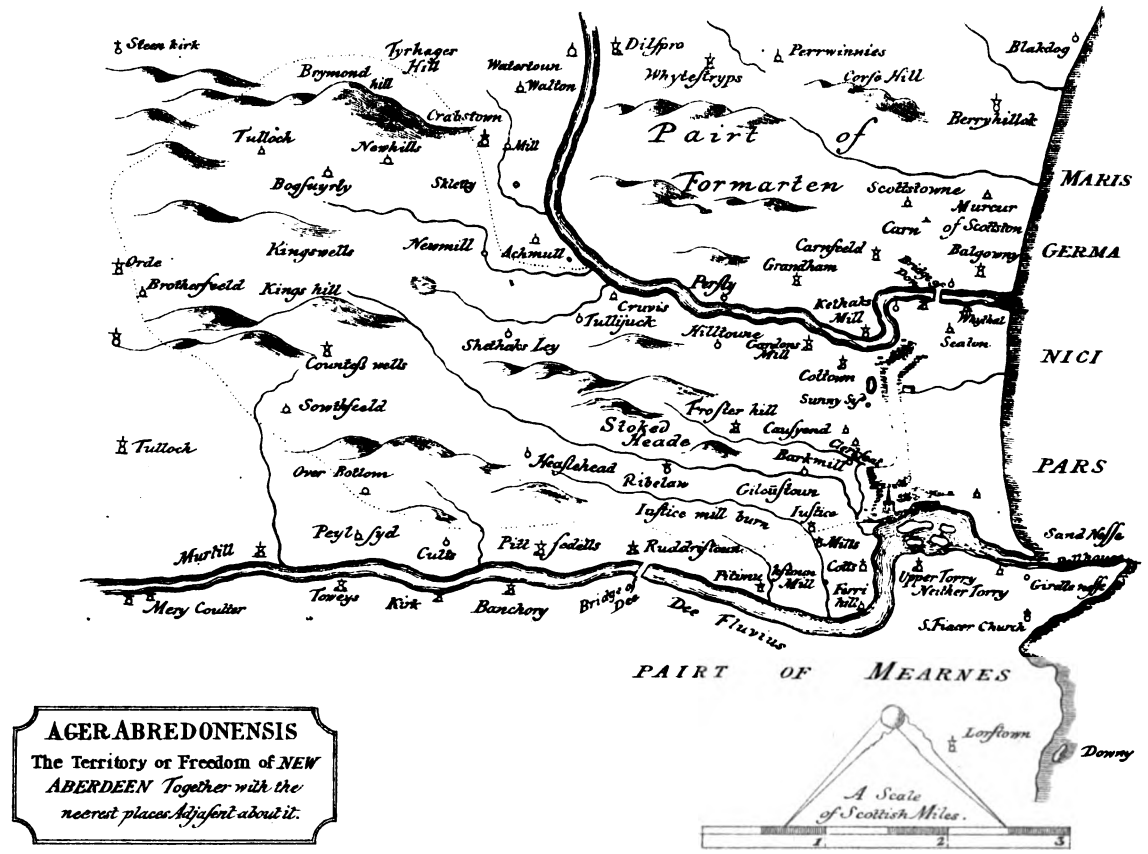

AGER ABREDONENSIS

The Territory or Freedom of *NEW ABERDEEN* Together with the neerest places Adjasent about it.

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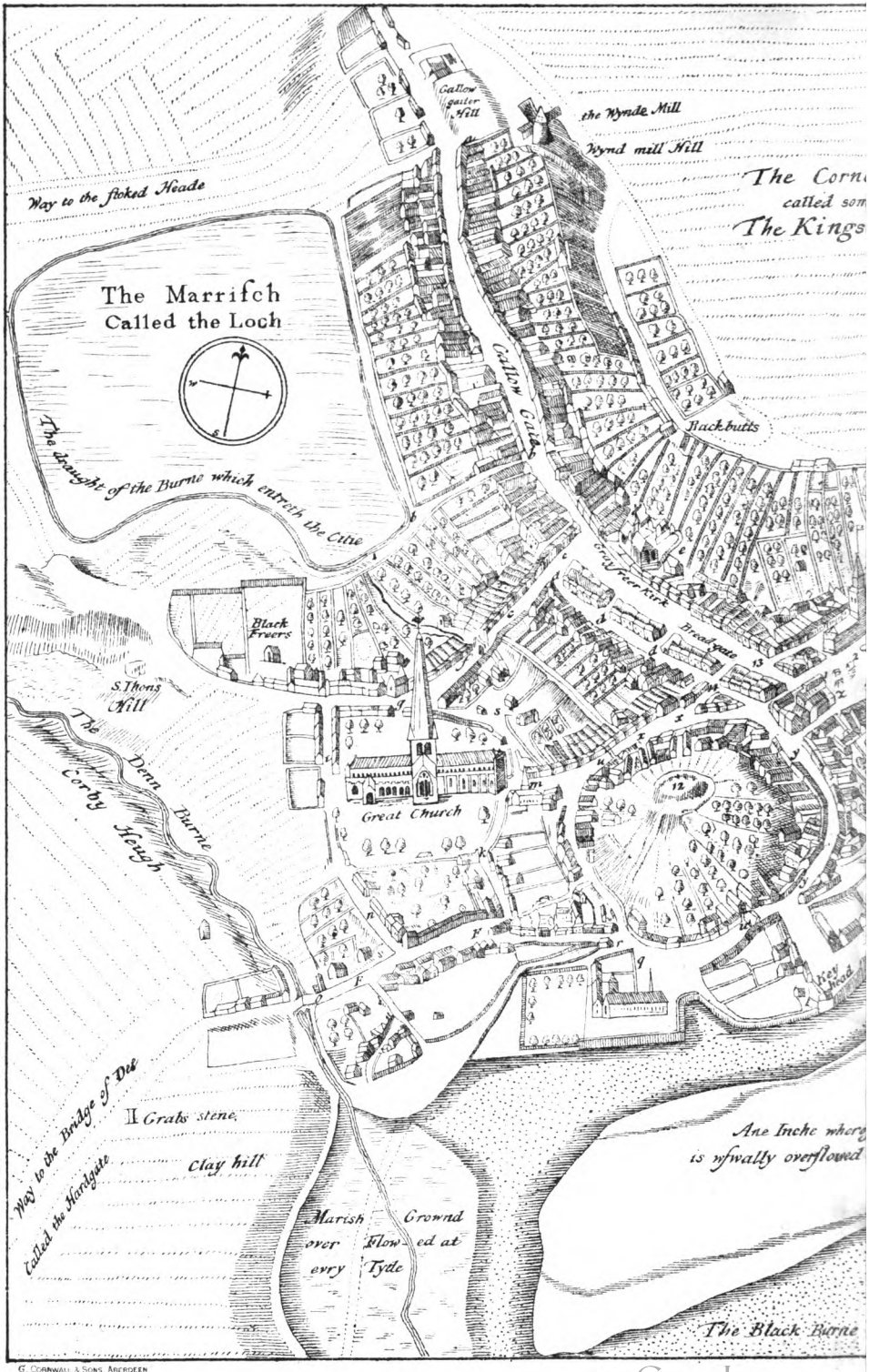
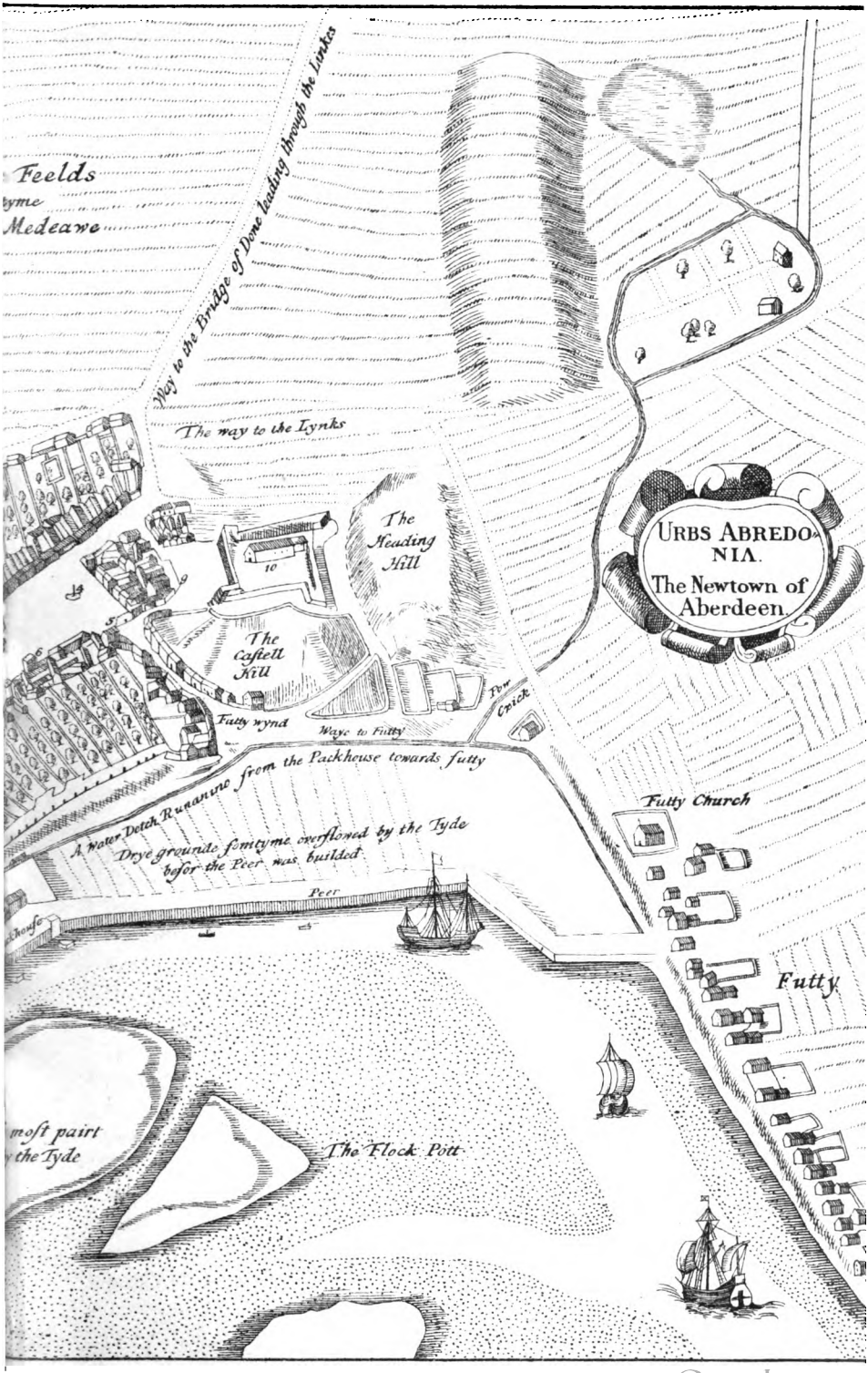


G. CORNWALL & SONS, ABERDEEN

PART OF THE MAP BY PARSON GORDON OF ROTHIE



(1661), ILLUSTRATIVE OF HIS DESCRIPTION OF ABERDEEN.

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REFERENCES.

a. Gallowgate Porte.
b. The Lane called the Vennel.
c. Over kirk gate Streete.
d. Streete called ye Gwestraw.
e. Marishall Colledge at the Gray freer kirk.
f. Over kirk gate Porte.
g. Scoole-Hill Streete.
h. Grammar Scoole.
i. Musick Scoole.
k. Correction House wynd or Lane.
l. Correction House.
m. Towns Hospitall.
n. Aidies Wynd.
o. Bow Bridge.
p. Green, or Bow Bridge Streete.
q. The Cross or Tradesmens Hospitall.
r. The Tarnty Mill.
s. The Flower Mill.
t. Midd Mill in the Green.
v. Nether kirk gate Porte.
x. Streete call'd the Neither kirk gate
y. Shipp Raw Streete.
z. Cheqwer Raw Lane.
1. *Entry to the Huckster Wynd.*
2. *Flesh Stocks.*
3. *Flesh Merkatt Crosse.*
4. *Fishmerkatt Crosse.*
5. *Futty Porte.*
6. *Earle of Marishalls House.*
7. *Laird of Pettfoddels House.*
8. *Rwins of the Templairs neare the Justice Porte.*
9. *Rwins of the Old Castell wall.*
10. *Castell Chappell within a New Sconce.*
11. *Shippraw Porte.*
12. *Saint Katherins Hill.*
13. *Bwildings called the Rownde Table.*
14. *Rotten Raw, a small Lane adjoyning to the Gwestraw.*

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district lying between the flourmill and the loch where Tannery Street formerly was, and Saint Nicholas Church had been intended to accommodate the general population of the town, for which the original small chapels had become insufficient.

By about the year 1000 there seems reason to conclude that the town of Aberdeen, soon to be distinguished as the Burgh of Aberdeen, had taken something like the shape it had when the same Mr. Gordon, in 1661, made his interesting and instructive sketch or map, which was reproduced and published by the Spalding Club in 1842.

The derivation of the term Burgh, by which so many Scottish towns came to be distinguished, is very curious and of great antiquity. The Scottish Burghs seem to have been formed and named after the English Borows, and these seem to have been formed and named after the pattern of similar institutions in various countries of Europe. Defence, and not trade, seems to have been the motive for the formation of the Burghs. The name, however, was derived, not from the sort of ground on which the towns stood, or from the defensive works which surrounded them, but from a class of men to whom their defence was entrusted, and it is probable that Trade had been the original motive of the association of that class of men. In the old Leges Burgorum and other ancient laws of Scotland, as translated in the fifteenth century, we are struck with the frequent recurrence of the word "borch," meaning in all cases a cautioner or surety, and in our ancient burghal institutions we find that in the practice of trade there was a law that every seller of any commodity should "streik a borch" (find security by a cautioner) that he had a good title to sell; and every man engaging in a lawsuit or appealing against a judgment was obliged in like manner "to streik a borch." Words of the same sound and meaning also occur in all or most of the Teutonic languages. In the German language particularly the word *Bursch* or *Bursche*, plural *Burschen*, seems to be of extreme antiquity, and indicates an association of men, involving the idea of mutual aid or suretyship, without reference to locality. This term (borch) we had, no doubt, brought with us from the Continent of Europe, perhaps from a more remote locality, but it is traceable in Britain for nearly twelve hundred years, with the appearance of still greater antiquity. We read in Sir Thomas Murray of Glendook's treatise, "De Verborum Significatione," as follows:—"Frie Borgh.—In the auld Britton Laws Bopher vel Bores is that quhilk we call Borrows, borgh or cautioner—and Alured King of England divided England

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in satrapias, centurias et decurias: and ordained that decuria suld comprehend ten persons, and centuria suld contain 100 persons, quhairof ilk one was cautioner and sourtie for others; in sik sort that the haill number and ilk ane of them was answerable for the fault and dede of anie ane of them, and swa was called free-borgh, free pledge or cautioner. Vide Antiquas leges Brittonum." This carries back the institution to the end of the ninth century, and to the laws of the Saxons of Wessex. But on referring to those ancient Britton Laws we find that the institution was well established at least a century and a half earlier; for in the Laws of Hlothhaere and Eadric, Kings of Kent, 673—686, we find that the institution of suretyship and also towns were distinguished by the same name. In the translation of those laws, published in 1840 by the Commissioners of Public Records, a King's or Royal Burgh is rendered *Burh*, and a cautioner is rendered *Borh*, as if they were distinct words, and this has been done apparently to prevent readers from mistaking one for the other; but on referring to the Saxon text both are found to be the same, the former being "*burig*" and the latter "*burigan*."

Gradually the name "burg" or "borow" began to be applied to many of the English towns, formerly known as "tuns" or "wics," but it seems to have been several centuries later that Scottish towns came to be called by that name, earlier in the south, later in the north; and we shall see that long after the inhabitants of these towns were distinguished as *burgesses* or *burghers*, the towns which they possessed were not invariably called burghs, but were simply called towns (villae).

In Scotland the Burghal institution seems to have been created before it had become usual to issue formal written charters. The first general charter in which both burghs and burgesses are mentioned was granted by King David, on the 28th day of March, in the 34th year of his reign [1363], and it deals entirely with trade privileges, saying nothing of defence. This charter seems to have been preserved somewhere till the 24th May, 1605, when the Lords of Council "in respect that the said chartour is grantit in favours of the haill burgesses of Scotland, and speciallie concernis thame and evrie ane of thame, and that the said chartour is of sic great antiquitie quhairby in process of time the samin will nocht faill to perische and becum unlegibill, be the quhilk occasion the saidis frie burgessis of this realme haveand speciall interes thairto will be greatumlie hurte and damnefeit and prejudgeit in thair liberteis and

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privileges grantit to thame thairby", ordained the same to be transumed and "insert in the buikis of Counsaill in authentick forme ad perpetuam rei memoriam." The charter is as follows :—"David dei gracia Rex Scotorum Omnibus probis hominibus tocius terre sue clericis et laicis Salutem. Sciatis nos cum consilio (&c.) concessisse dilectis nostris burgensibus Scotie facultatem emendi et vendendi liberam ubique infra libertatem suorum burgorum prohibendo ne aliquis eorum infra limites alterius emat vel vendat nisi licentiatus. Prohibemus etiam ne Episcopus aut Prior vel persona eclesiastica. Comes Baro vel persona secularis emat lanam pelles coria aut alia mercimonia sub quocunque colore cuius—cumque fuerit status neque vendat nisi solummodo a mercatoribus burgorum infra quorum resident quibus precipimus quod huiusmodi mercimonia presentent apud forum et crucem burgorum ut mercatores emant et ipsis effectualiter proferunt sine fraude et ibidem soluant custumam. Regis Prohibemus etiam ne aliqui extranei mercatores cum nauibus et mercandisis venientes vendant aliquod genus mercimoniorum nisi mercatoribus nostrorum burgorum sub pena Regie defensionis nostre. Quasquidem concessiones libertates constitutiones pro perpetuo duraturas tenore presentis carte nostre confirmamus. In cuiis rei testimonium presenti carte nostre confirmationis sigillum nostrum precepimus apponi (apud Perth xxviii. die mensis Martii anno regui nostri trigesimo quarto). Testibus venerabillibus in Christo patribus Willelmo Episcopo Sanctiandree. Patricio Episcopo Brechinensi Cancellaris Roberto Senescallo Scotie nepote nostro. Willelmo comite de Dowglas Roberto de Erskyne Camerario nostro."

Of the original act or ceremony by which a town was converted or erected into a Royal Burgh, or into a Burgh of minor status, we have no record. There is no specimen of any formal written deed of any Burgh until after King David's days; and yet we can see that prior to this charter there must have been an extensive family of Burghs already erected. We learn, however, from the Leges Burgorum that in order to entitle a Burgher to the privileges of his order he was bound to acquire and build upon and "defend" a certain measure of land within a Burgh, and it also appears that the leading characteristic of a Royal Burgh was that it should be the seat of a royal castle garrisoned by royal troops, under the command of a Constable of the king, and which the burghers and neighbouring barons had to aid in garrisoning and defending, by contributing men

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for that purpose. Barons and ecclesiastics, also, who possessed or were superiors of Burghs north of the Grampians, were obliged to build and maintain castles within their bounds.* As to the particular manner of declaring that a town had taken its place in the family of Burghs, one may suppose that when the castle was built and occupied there had been some open-air assembly of the inhabitants held, and proclamation of the fact made to the sound of trumpet, &c., and so the fact would be accomplished and the preservation of its memory committed to the grasp of living testimony and oral tradition, more tenacious in these days than in ours.

In some such way as this, and at a time not now known, the town of Aberdeen, at the mouth of the Dee, had been converted into a Burgh of the King, and its inhabitants, who had the necessary qualification, invested with the dignity and privileges of "burgenses domini regis," or "kingis borowmen."

Our Burgh was never officially or correctly called *New* Aberdeen. Several writers, Mr. Gordon, Parson of Rothiemay, included, have called it so, but this has evidently been done to avoid a misapprehension as to which of the towns he was at the time writing of, and in the earliest records our Burgh appears simply as Aberdeen. As to the title of our Burgh to be called a City also, discussions have been raised, and many people believe that Old Aberdeen has a preferable right to that title as having been the seat of a bishop. But this has nothing to do with the question. The title of City seems to have been one of courtesy, indicating merely magnitude and importance, and we have an authority, as nearly infallible on this point as could be wished, where Pope Clement, in a bull, confirming the incorporation of the University of Old Aberdeen, refers to that institution thus, "Dilecti Filii, Rector Principalis et alii magistri Universitatis Studii generalis Ville veteris prope civitatem Aberdonem nobis humiliter applicari fecerunt."

Probably the first charter in which Aberdeen is mentioned was one granted by King David to the Clerics of Deer, and copied by them into their book, the exact date of which seems to be unascertained. It is given, "apud Abberdeon," and refers to certain privileges of these Clerics, written in their book—"on which they pleaded at Banff and swore at Aberdeen (sicut inlibro eorum scribtum est et diriationauerunt apud banb etjuraurunt apud Abberdeon)" from

* Stat. James I., Sec. 82, 1426.

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which we may infer that Aberdeen was then for the time the head-quarters of the King's Court, where he had heard and given judgment on such questions. As there is no mention of the Bishop of Aberdeen amongst the numerous witnesses to this charter, it seems not unlikely that it had been granted prior to 1134, when a Bishop was translated from Mortlach to Old Aberdeen.

The next mention of Aberdeen is found in a charter granted also by King David I., at Forfar, in the 13th year of his reign (1134). This charter is not, I believe, extant; but Mr. Orem, in his "*Description of the Chanonry, Cathedral, and King's College of Old Aberdeen, in the years 1724 and 1725*," gives it at length. The mention of our Burgh in this charter is brief, but interesting. The King thereby grants "to God and the Blessed Mary, St. Machar, and Nectanus, Bishop of Aberdeen (Episcopo Aberdonensi), the haill village of Old Aberdeen, &c. ——; the tithe of the ships called Snows (canium navium) which come to Aberdon; the tithe of victual there; my own tithe of the revenues of Aberdeen; the tithe of the Thainage revenues and escheats belonging to me within the Sheriffdom of Aberdeen and Banff, &c." So here, in 1134, we have mention made familiarly of Aberdeen and Old Aberdeen, even as at the present day; and we learn that even then great ships resorted to our harbour. As to these ships called Snows, the "skeely skippers" of the port would no doubt have been more amused than surprised if they had been told that the King's lawyers knew so little about ships as to translate a snow into *navis cana*, or *candida*, a white ship; the truth being that *snau* or *schnau*, the vernacular name of these vessels, meant a snout or beak. They were ships probably of the largest size used for merchandise, with a fore and mainmast, and having an exaggerated beak in front of the forecastle to enable them to carry a jib-boom, and therefore more headsail. In latter days these vessels had a rudimentary mizenmast on the top of the tall castle on the poop; and it is no doubt these snaws which we see represented in Mr. Gordon's map, and in that wonderful picture of the town and harbour of Aberdeen which is placed above the fireplace in our town-hall.

The earliest charter granted specially to Aberdeen was by King William the Lyon, in or about the year 1179. It confirms certain mercantile rights to "my burgesses of Aberdeon," but makes no mention of lands, territories, or boundaries. It also makes mention of burgesses elsewhere in the north of Scotland; but does not apply

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the name Burgh to Aberdeen or to any other place. The whole drift of the charter is to assure to the King's burgesses of Aberdeen, and all the burgesses of Moray, and all the King's burgesses dwelling on the north side of the Grampians, their ancient right of holding what is Latinised as "ansum;" and which is believed to have referred to a mercantile League or Bond, which existed amongst our merchants, and probably identical with that which afterwards took the form of the Hanseatic League amongst the merchants of the Continent of Europe.

A second charter by King William the Lyon about the year 1196 deals entirely with personal privileges to the Burgesses "de Aberdon," and does not name either burgh or territories.

Our third charter is by King Alexander II., of date 1226. By it the king grants to his "burgh and burgesses of 'Aberden' the same rights and privileges which his predecessors gave to the burgh and burgesses of Perth;" and it enumerates those privileges referring exclusively to trade. But in fact there is no appearance of Perth having received any earlier privileges than Aberdeen, or any earlier charters; only it was becoming the fashion for the king, when confirming an old right, to refer to it as having been originally conferred by his predecessors; and this practice long persevered in led ultimately to the general belief that all rights had flowed originally from the king. This clause contains a remarkable reservation, which I have not found commented on elsewhere. After repeatedly mentioning the county and the Burgh of Aberdeen, as distinguished from each other; thus, for example—"A stranger merchant within the County of Aberdeen, beyond the Burgh of Aberdeen," it concludes thus—"All these liberties and usages, however, I grant, and by this my charter confirm to them, without prejudice to the liberties and free usages which before this grant were given to other burghs and burgesses within the Bailliwic of Aberdeen (infra balliam de Aberdeen)." To expiscate and explain the meaning of this quotation might require much study and research, and what little I can say about it, will be more conveniently brought forward after I have gone over the territories of the Burgh in detail.

It is to be observed that at this time (1226) the process of feudalising the land tenures in Scotland was not only not completed, but had not made much progress; and we have as yet no indication of that process having been applied to the Royal Burghs of Scotland. The land did not, as yet, in theory belong to the king, and those who

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possessed it were not "vassals" of the king, or of any subjects representing the king in the characters of baillies, aldermen, maors, barons, thanes, or earls. An owner of land at that time held it by what is now called allodial tenure; he owed allegiance and service to the State, as one of the community, and paid to the king, or the king's representative, a certain tax, in proportion to the extent of land he owned. As yet, accordingly, we have no formal gift by the king of the Burgh to the community; because as yet the Burgh did not in theory belong to the king, but to the community itself. The feudal theory, however, was progressing, and holders of land were becoming accustomed to feel that in order to secure the recognition of their old rights by the crown, it was desirable to have them acknowledged by written deeds.

Accordingly, in pursuance of this feeling there was obtained from King Alexander III., of date about 1277, a charter, the gist of which is, "Know that our burgesses of Aberdeen have justly assumed possession of (suscepisse) their lands, their men, and their universal possessions, and all their goods, moveable and immovable (neither the word nor the full idea of *heritable* being yet developed), under our assured peace and protection." The word "suscepisse" has apparently been chosen as a compromise between expressions which on the one hand should have too broadly asserted the king's right to give, and on the other hand should have too plainly allowed the right of the grantees to have and to hold without such gift.

I cite the next instrument merely to show that in its day the title of burgess seemed to be of more importance to burgesses than the title of burgh was to the town they dwelt in; and in corroboration of my remark that the burgess class seemed to have importance more in their character of an association of men than as the inhabitants of a burgh. It is a commission by the "Custodes Regni" in 1287, to certain men to hear and determine a dispute which had arisen between the burgesses and community of Aberdeen on the one part and the burgesses and community of Montrose on the other part—"Super nundinis villarum de Abirden et de Munros (concerning the markets of the towns of Abirden and Munros)." It may be that the "Custodes Regni" did not share the willingness which the preceding kings had shown to foster and exalt the Burghs as an element of the State, and that while they could not ignore the burgesses amongst whom, expressly in their character of burgesses, this dispute had arisen, they were willing to ignore the Burghs them-

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selves, and that hence they designated them by the humbler name of towns.

The next instrument shows more care and discrimination in this matter. It is a petition by the burgesses of Banff, of date 1289, to the "Custodes Regni," to settle a difference which had arisen as to the interpretation of the charter of King Alexander II., before referred to; and here the petitioners design themselves, "Prepositi ac ceteri burgenses commune de Banff," while Aberdeen is carefully designed as a Burgh, the fact being, that although Banff now claims to have been then a Royal Burgh, it was not formally acknowledged as such till 1372. In this petition the burgesses of Banff, although probably believing that they were king's burgesses, had abstained from claiming that dignity, in case a question raised on that point should have hindered or prevented the hearing of their petition.

We now come to the year 1313, when the pressure upon occupiers and claimants of land to take out charters had become strong. To the west of the Burgh of Aberdeen there lay a large tract of waste land, called the Forest of Stocket, which the community of Aberdeen had possessed for pasturage and fuel, and over which their Magistrates had no doubt exercised jurisdiction as governors; but it was also a King's Forest, and used by the King as a hunting ground. Here there was doubtless a field for three competing claims which would become more troublesome the longer it remained unchartered, viz., the Aberdeen people claiming the use of it as their waste; other neighbours encroaching and founding similar claims; and the King, whose claim would gather strength the more the other two disputed over it. For the King's lawyers would say that whatever did not belong to other people belonged to the King; and, therefore, other disputants, in weakening each other's claims, strengthened that of the King. The claim of Aberdeen, however, had been recognised as good, and a charter had been demanded; but the difficulty was what the charter should convey. There had, at the same time, been an arrangement in contemplation for changing the allodial tenure of the Burgh of Aberdeen into a feudal tenure, and it had not been determined what place, if any, the Forest of Stocket should hold in the new feudal grant. As a temporary arrangement, King Robert I., in 1313, granted a charter or commission to the burgesses and community of the Burgh of Abirden to have the care and custody of the whole Forest of Stocket "to be held and had by the said Burgh, Burgesses, and Community of the same, and their heirs and

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successors," the green trees and right of hunting only being reserved. In contemplation of obtaining a better right this had no doubt been regarded as satisfactory, and it had the effect of excluding all others from the Forest in the meantime; but this of itself would have been a dangerous title to stand upon, for it might have been open to the Crown afterwards to plead, if it had taken the trouble to plead on the subject, that this was only a commission during the King's pleasure, and in the meantime the old consuetudinary rights of the Burgh would have been receding into the dim and uncertain region of the things that had been.

In 1320, however, King Robert I. granted a regular feudal charter, in the form then in use, to the burgesses and community of the Burgh of Aberdeen, of the Burgh of Aberdeen and the Forest of Stocket in perpetuity "in fee and heritage and in free burgage," with mills, waters, fishings, petty customs, tolls, courts, weights, measures, and with all other liberties, conveniences, easements, consuetudes, and their just pertinents belonging, or which in future should belong, to the sett (assedacionem) of the said Burgh and Forest by law and use and wont, paying therefor yearly to the King or his heirs the sum of two hundred and thirty pounds six shillings and eight pence.

And thus the feudalising process, as between the King and the Burgh, was completed, and hereafter the Burgh, instead of paying a sum corresponding to each rood and acre of land occupied by its citizens, paid a fixed sum annually to the King, who was acknowledged to be the proprietor of the land, while the Burgh acknowledged that it held the land on a perpetual lease.

Subsequently, by various charters and Acts of Parliament of the times of James VI. and Charles I., the former charters were confirmed, and the rights and jurisdictions elaborately set forth, and three other pieces of land were also incorporated with the Burgh. The first of these was Rubislaw. This had probably been a town-land lying close to the Burgh on the west, and had either not belonged to the Burgh originally, or had been detached from it, and given to some other overlord. In 1359 a part of it belonged to a Burgess of Aberdeen, and a certain "John de Inchecur" is designated "dominus de Rubislaw." By 1379 it had been acquired, probably bought, by the Burgh, and in that year King Robert II. granted it to the Burgh of Aberdeen, to be held in fee and heritage in free burgage. The second was the land of Cruives, which John Bannerman of Alsike conveyed to the Burgh, for a price, no doubt; but these old

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deeds say nothing about prices. In conveying this land it is, in 1459, described as "anciently spoken of as le smythyhalch (the smithy haugh) in modern days, called le Croes." This also was subsequently incorporated with the Burgh. The third was the land or territory of Futty, a name since corrupted into Footdee—whereas the original names seems to have been brought from Norway by Scandinavian emigrants. There seems to be great probability that Futty had originally been a Townland distinct from the Burgh, which had subsequently absorbed it. A considerable marsh had once separated it from the Burgh, and, as I have remarked before, it had certainly been, very early, the seat of a fishing population. In 1413 mention is made of a citizen bearing the name of "Laurentius de Futty," which founds a *prima facie* presumption that he or his ancestors had stood in the position of proprietors or overlords of that land; and in many old deeds it is referred to as "the territory of Futty," "the town of Futty," and "Futtieland." It was never very formally granted to the Burgh; but in one of the elaborate Crown charters before mentioned, it is included as "the green medow near the City, called Futtie."

One other territory remains to be mentioned, because it was entirely surrounded by the Burgh and its territories, but was never included amongst them. This is the land of Gilcomston, comprehending about 340 Scotch acres, close to the Burgh on the north-west. This land had belonged to the Earl of Marr, and was feudalised in his possession. It passed from him to "John de Ross," and thereafter to the family of Menzies, who sold it to the Burgh in 1680. But it never was incorporated with the Burgh, nor was it subject to its taxes or jurisdiction. It is described as a Five Pound land of old extent, and corresponds roughly with three ploughlands with some addition of waste, or with four ploughlands with something lost by the accidents of time. It seems probable that this land was the seat of an ancient community, where Jack's Brae and Loanhead now are; and we find that on one occasion the Town Council met and transacted business at Gilcomston, because the plague was in the Burgh.

The charter granted by King Charles I. in 1638 is the most elaborate of all that have been obtained by the Burgh. It doubtless contains nothing beyond what the Burgh had before, but in conformity with the legal usages of the time, it contains full catalogues of rights and privileges, which, according to the older prac-

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tice, were taken for granted, and were proveable by use and wont and ancient possession. It may be well to rehearse, as shortly as possible, what this charter of Charles I. confirms. They are—the Burgh of Aberdeen, with precinct, walls, ditches, gates, &c.—lands within the territory and liberty of the Burgh—the forest of Stocket, with its pertinents—the lands of Rubislaw—the lands of Cruiffeis—the waters of Dee and Don, with the salmon fishings therein, as then possessed and occupied, particularly the Raik, Stells, Medchingle, Pot and Fuirds, on both sides of the Dee, from the bar at the river mouth to the bridgewater at the Bridge of Dee—the King's Cavill fishing in Don, as well above as below the bridge, and the fishing of Cruives, from Don mouth to Cruive burn—the salmon and white fishing in the sea, between Dee and Don mouths, and on both sides of these river mouths—the insches and scheils, "infra et super," the waters of Dee and Don—the right of having ferry boats, one or more, on both sides, where the said fishings are—the Upper and Lower Justice Mills—a mill on the Bucksburne, and another on the Denburne—the windmill at Gallowgate-head—two sea mills at the shore—the right to build more mills—the castlehill, the green medow and suburb called Futtie, with the Chapel thereof, with all boats and white fishings pertaining thereto, and with the bulwark port and shore (littore) of Aberdene, and milldams and passages thereof—the liberty and privilege of "loading and lousing" ships boats and others whatsoever, in Dee and Don, on either banks thereof —the right of collecting petty customs, anchorages, and "schoir silver," and other duties, as the Burgh of Edinburgh collects the same at the port and harbour of Leith, or at any other port and harbour in Scotland, a tax to support the bulwark—the Bell and Petty Customs, and tolls and other customs, used and wont—Tron and other weights—all lands, &c., which formerly belonged to whatsoever abbeys, priories, preceptories, chaplainries, prebendaries, alterages, and other benefices—the Common Loch—the hills called Womanhill, Playfield, Saint Catherineshill, Heidinghill, and Gallowhill—the fields and plains called the Links between the watermouth of Dee and the watermouth of Don"—besides a number of jurisdictions and rights which need not be enumerated in a description professing to refer to territories only.

In addition to this, the Magistrates of the Burgh received a series of commissions from the Grand Admiral of Scotland to act as his deputies, and by virtue of these commissions they exercised an extensive and

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important maritime jurisdiction. They also regulated and limited the number of the fishing boats to be used in the port; they divided the sea into beats, and every year, on a certain day, at a certain hour, the boats were started and made a race for the respective beats, and the boat which first reached and claimed any beat had the sole use of it during the year.

The right of collecting shore-dues in the harbour at the mouth of the Dee is now represented by the powers in that behalf of the Harbour Commissioners. The same right was also exercised in Donmouth so long as it was worth the expense of collection.

I must again repeat that these various grants of King Charles's charter, the ecclesiastical properties excepted, are not to be regarded as rights conferred by King Charles or any other king, but only as an articulate rehearsal of the ancient rights of the Burgh as they were possessed, and established by custom when and before King Robert I. granted his first formal charter of the Burgh.

I now proceed to notice shortly the various component parts of the Burgh, with its Freedom and the Forest of Stocket.

As already mentioned, a Royal Castle was the special kenmark of a Royal Burgh. There might apparently be a body of King's Burgesses in a town; but without a Royal Castle the Burgh was not a Royal one. Aberdeen had its Royal Castle on the Castle Hill, that is where the Barracks now stand. It is very likely that it may have been built by King David I., but this is uncertain. Its main purpose had been to afford a tenable stronghold against English assailants arriving by sea; but it was found not only to be untenable, but to afford a temptation to these chronic enemies to take and occupy it. However, it turned out to be as untenable by the English as by the Scotch, and it was ultimately thrown down and abandoned; and thereby hangs a tale. We have not full particulars of the following episode, but it seems likely that it had been represented to the Crown lawyers of the day that since Aberdeen no longer possessed a Royal Castle, it was no longer a Royal Burgh; and if so why should it possess any of the valuable pertinents of a Royal Burgh that could be taken from it. This *ex parte* argument had seemed good to the Crown lawyers, and as the party urging it was no less a personage than Sir Andrew Wood, our celebrated admiral, it seems that without more ado the Castle Hill and the Forest of Stocket were conferred by a Royal Charter on Sir Andrew, and about the year 1494 he proceeded to claim possession of his gift. Had this

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attempt been successful we need be at no loss to guess what would have followed. Sir Andrew would next have got a charter of the whole burgh, that is of all the rights in it belonging to the king. He would have become the superior of the burgh, and Aberdeen would have subsided into a Burgh of Barony, ceasing to be a part of the fabric of the State, and thereafter its interests would not have been regarded or dealt with on public grounds, but solely with reference to the interests of the superior. But this was not to be, for on the 28th January, 1494, the citizens came to the following resolution :—"The saide day, the aldirmane, balyeis, consale, and communite, warnit be the hand bell throw the haile toune, gathreyit (this was a genuine head court) and circual inquerit be Philip Dumbrek, officiar, grauntit and oppinly schew that tha wald ayfaldly (unanimously) defende thair landis and heretage of the Stokat, baith with thair personis and gudis, at all thair possibilite, quhilkis is purchest be Androw Wod as thai are informit." In the following May several resolutions were adopted to the same effect, and as Sir Andrew's claim was brought forward before the Lords of Council, Commissioners were appointed "to pass til Edinburghe" and oppose the claim. It is evident that the Aberdonians were prepared to fight the battle legally in the first place, and if the decision had been adverse to them, we can imagine the gusto with which, in the imperative statutory language of the period,* they would have declared the doome to be "FALS, STINKAND, AND ROTTEN," by way of constitutional appeal against it; but that they would have girded on their swords and resisted the execution of the decree by force there cannot be a doubt. Such extreme measures turned out to be unnecessary, however, for Sir Andrew Wood did not produce his charter to the Lords of Council, who, on 19th June, 1494, having had the charter of the Burgh and Forest by "Robert the Broise, of moust nobill mynde," laid before them, decreed "that for ocht that thai have yit sene, the said Alderman, Baillies, and Communitie sall broik and joise the said Burgh of Abirdene, with the pertinence as thai brokit of before."

Starting from the Castle Hill as a central point, we look for the next characteristic mark of an ancient Royal Burgh—viz., the four quarters into which it was divided. This division was universal in the Royal Burghs. Four bailies and four quarters; each bailie

* Stat. 9th James I., Sec. 116, 1429.

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having a quarter under his special superintendence. It does not seem probable that the outer boundaries of the quarters were at any time fixed and unalterable; neither was the number of burgesses limited. It seems that the bounds of the quarters might be extended so as to accommodate each burgess with at least the statutory portion of land which he was bound to hold, to build upon, and to defend, and for which he had to pay yearly a tax or scat to the amount of five pence. "Ilke burges sall geyff to the King for his borowage at he deffendis (quod defendit), far ilke rud of land V d. be yhere." (Leg. Burg. I.)

It may not be tedious to hear the explanation given by the said Sir Thomas Murray of this primitive measure of land:—"Rood. It is of veritie that three beare cornes without tailes, set togidder in length makes ane inch; of the quhilk cornes, ane suld be taken off the mid rig, ane off the side of the rig, and ane off the furrow. Three fute and ane inch makes an elne; sex elnes lang makis ane fall; quhilk is the common lineall measure and mette. And sex elnes lang and sex elnes broad maks ane squair and superficiall fall of measured land. And it is to be understand ane rod, ane raip, ane lineall fall of measure, are all ane and signifies one thing, for ilk ane of them conteinis sex elnes in length, albeit ane rod is ane staffe or gade of tymmer quhairwith land is measured. Ane raip is made of towe, sik as hempe, or uther stuffe, and sa meikle land as in measuring falles under the rod or raip in length is called ane fall of measure ane lineal or fall. Likeas the superficial fall is the measure both of the length and the bredth. Item, ten falls in length and foure in bredth makes ane ruid; foure ruid makes ane aiker. And swa ane discreit and true man may measure ilk aiker of land, lang or schort, with rod or raip be the measure of the fall, swa that he keips just count and guid remembrance that the ends of the rod or raip be richtly and even laide, without fraud or guyle."

The 49th Article of the Leges Burgorum is as follows:—

"Of hym that yharnis to be mayd Kyngis burges, na man may be the Kyngis burges bvt gif he do service to the Kyng of als mekyl as fallys til ane rude of lande at the leste." The 7th Article of Enquiry, at the Chamberlain airs, was—"Gif the bailies have given saising of any land beyond what is defended;" and the 27th Article of the Leges Burgorum is—"Wha sum evir be made new burges of a waste land, and he hafe na lande wythin the burgh herberyit (inhabited), in the first yere he sall haf kyrset (respite or delay), and

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efter the fyrst yere he sall haf herberyit lande and byggyd." From all which provisions we see that a burgess must have at least one rood within the burgh "herberyit and byggyd"—that he may have more land than one rood; but that the bailies had to see that sasine was not given of more land than was "defended;" by which it was probably meant that land which was not hitherto built upon and inhabited within the burgh required, when given off, to be fenced and walled in contiguously to the other defended lands, so as to form a compact and integral part of the defensible town.

This seems to provide for the case of a thriving and increasing Burgh, with new burgesses being constantly added to its former number; so that the bailies might assign new sites out of the suburban land to be built and inhabited, or at least fenced, taking due care to preserve the Burgh in a compact and defensible form.

The four quarters would therefore increase in size as new enclosures were made on their outer boundaries. Whether this was originally contemplated in the institution of town lands we cannot tell. Where agriculture was the chief, and trade only a secondary interest of the community, it is probable that any increase of the village mark at the expense of the agricultural land would have been regarded with jealousy and disfavour. But where trade was the chief occupation of the community, the reverse would be the case; and where the community consisted of a body of trading burgesses, who alone probably had a right to the occupation and use of any part of the town lands, it is evident that public opinion, and therefore custom, would be in favour of the village mark being indefinitely increased. This probably had been the case of all the royal burghs; and therefore if we attempt to define the ancient limits of the quarters of Aberdeen, our description will only be true for the particular date to which the description applies. We have of date 1764, ——— a description of the Four Quarters of Aberdeen—minute and distinct as to the divisions of one quarter from another, although somewhat indefinite as to their outer boundaries; but as it would appear that Aberdeen had attained a certain pretty distinct size and shape at the time that the feudalizing process was about completed, and as it seems to have continued of that size and shape for a good many hundred years, and as the sasine records, and old maps enable us to describe the burgh so shaped and defined pretty exactly, I shall confine my description of the Quarters to the area so defined—leaving it to be understood

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that the Quarters had no doubt once been of smaller extent, and that ultimately they expanded to a greater size.

No amount of narrative description, even to one familiar with Aberdeen, could convey so clear an idea of the appearance of the burgh in the year 1661, as a glance at Mr. Gordon's map made in that year; and for the purpose of securing such clear idea to the reader a portion of that map is lithographed to illustrate this Essay. Such as Aberdeen then was in size and figure, there is some reason to believe it had been for more than three hundred years before—and such, with little change, it continued for a hundred years later, and even till the commencement of the present century. About the year 1850, the writer conversed with an old gardener, of the name of Alexander Smith, then about 80 years old, residing near the new Bridge of Don, who described the Aberdeen of his youth as being altogether like that described in Mr. Gordon's map; and, as I have said, the sasine and other records indicate that in the fourteenth century the "herberyt byggyd and defended" Burgh of Aberdeen had occupied pretty exactly the area there described. Notwithstanding the changes of the last seventy years, anyone acquainted with Aberdeen will easily recognise what was comprehended in the old Burgh. The outline ran from the east end of the "Peer," where one of the ships, called "snows," is riding, between the Heading and Castle Hill, along by the line of East and West North Street, by the foot of the east slope of the Gallow Hill to the Windmill, across the Gallowgate, then along the foot of the west slope of Gallowhill to the foot of the Vennel (St. Paul Street), across to the west side of Sillerton (Gordon's Hospital Grounds), along by Schoolhill and Woolmanhill to the Denburn, down the Denburn to the Harbour, and along the north side of the Harbour to the spot where it began. The Quarters had their common centre about the junction of Broadgate, Castlegate, and Shiprow, and were named respectively the Futty, the Green, the Crooked, and the Even Quarters. The two former names indicate their places. The Green Quarter comprehended Saint Catherine's Hill, and the space immediately west of it to the Bow Brig. The Futty Quarter comprehended the space immediately east of Saint Catherine's Hill to the Castle Hill. The Even Quarter comprehended the half of the large space north of the Green Quarter on the west of Guestrow and Gallowgate. The Crooked Quarter comprehended the remaining space north of Castlegate, and east of Guestrow and Gallowgate. It

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will at once be noticed that the two last-mentioned Quarters comprehended a much larger area than the two first mentioned, which, assuming that the Quarters had originally been of equal areas, favours the theory that the town had, in its early stages of growth, increased and spread away towards the north more than in other directions.

The Gates or Ports next claim our attention. Our Burgh had six of these; but we learn from Article 29 of "Fragmenta Quaedam veterum Legum et Consuetudinum Scotiae undique Collecta," that four was the number which an ancient Royal Burgh ought to have, and that probably this number was a notable kenmark of a Royal Burgh, even as the four Quarters were. This fragment commences thus, "Burges or merchandis or pipouderous (Dusty Feet or Pedlars), when thai pas utouth the iiij yettis." Two of our six gates had therefore probably been added at some unknown time. The Trinity Port was across the mouth of the Shiprow, a little west of the head of Shorebrae. The Futty Port was at the south-east corner of the Castlegate, at the head of Hangman's Brae. The Justice Port was at the north-east corner of Castle Street. The Gallowgate Port was in Gallowgate, near the Windmill. The Upperkirkgate Port was near the foot of Upperkirkgate, about the mouth of Burn Court probably. The Netherkirkgate Port was at the Foot of Netherkirkgate, a little west of the south end of Flourmill Lane. These Ports or Gates seem to have been solid heavy walls, pierced by an archway like Temple Bar in London, the Bar of Southampton, and other old English Burghs. Ours were removed in or about the year 1768, as being useless and obstructive to the streets.

The "walls" and "fosses or diches" of Aberdeen have given rise to disputes; the question at issue being, whether they ever existed or not. But there is, in truth, no room for question on the subject. The fact that the Burgh was provided with gates or ports is *prima facie* evidence that the other parts of its outline were closed up in some defensible manner, and the passages already quoted from the old Laws indicate that the building upon and defending of the roods occupied by the burgesses, meant that the building should be so managed as to conduce to the defence of each particular piece of ground. Then if we look again at Mr. Gordon's map, we find exactly what, under these circumstances, one should expect, that the roods or building areas were contiguous and so grouped that the defences of each were part of the defences of the whole. We know,

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indeed, that Aberdeen was not, in the ordinary sense of the words, a walled town, that is, it had not a continuous line of external walls distinct from the buildings of the town itself; but we learn from sure testimony that the defences naturally afforded by the house and garden walls were supplemented where needful by walls and ditches specially constructed for defence. In 1452, a head court of the inhabitants determined that "the toune sal be stryngthnit and fortifiit with walles, and strynthes in all gudeli haste," and a committee was appointed to determine what should be done, and to have it done. In 1480, March 17, denunciation is made of those who oppose the making of the "fossis about the toune;" and in 1481 another committee is appointed to "devise, see, and provide for the making of the fossis, and performing of the walling of this toune, for the strinthing of the sammyn." All this, however, scarcely proves that the walls and fosses were actually made; but one may trust to the accuracy of Mr. Gordon's knowledge when, writing about one hundred and eighty years later, he says—"The unevene ground that the toune is situated upon makes it quyt incapable of walls, or diches, or bastions, according to the moderne invention of fortificatione; yit during the time of the civill warre, twyce, bot in vayne, it was attempted to be fortified, or rather intrenshed about. At both tymes, scarce were the works perfytted when they were throwne doune againe by the command of such as for the tyme seized the toune." We have no record of the lines of those defensive works which seem to have consisted more of ditches than of walls; but I am told that within the present century there was a wall or part of a wall running along the east side of Flourmill Lane, which was believed to have been part of these defences. In looking at Mr. Gordon's map, it will be seen that this had been a comparatively open place, and that the ground immediately to the west, between that wall and the St. Nicholas Kirk, was almost clear of buildings. The same map also shows, at the present line of Virginia Street, markings immediately north of the Shorelands ditch, which look like representations of an earthwork and a wall or stockade on the top of it. Probably a military engineer, looking at that map, could indicate pretty exactly where the works had been.

In considering the defences of the town, also, we must not overlook that even now we can in many places perceive how the land of each burgess was made in itself an independent and pretty secure stronghold. Take for example Stewart's Place in Guestrow, and

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we see that the house next the street was in itself a fortification on that side—that a low gate gave entrance to an inner courtyard around which several houses were comfortably built, and that the back walls of these houses, and strong high walls enclosing the ground behind, completely closed in the whole space, and made it capable of easy defence against any assault by enemies not provided with military engines for battering down mason work. I hope that some one having the necessary skill will take the trouble to delineate and make accessible to the public descriptions of a number of these interesting nooks and corners before they are finally improved away and obliterated.

Before leaving the ancient Burgh, as built and defended, I would again draw attention to Mr. Gordon's map, and particularly to the representation of Saint Catherine's Hill there given. It will be observed that it is almost circular, and is entirely surrounded with buildings; that it is contiguous to the Quay head, and that two of the ports are on its margins. The present levels of the ground are so different from what they were at the beginning of this century, and even thirty years ago, that we have some difficulty in recognising the propriety of its being called a hill. But behind the houses on the east side of Adelphi, the crown of the hill, or part of it, is still visible; and the steep slope of the Shiprow, the Netherkirkgate, and Carnegie's Brae still remain. The making out of Union Street had obliterated a great part of the north side of the hill; and the laying out and erection of Market Street on a line of tall arches on the west side almost completed its obliteration. But allowing for these changes, we can realise the fact that this hill had once been a well-defined and commanding eminence. Its closeness to the Quay head, along with its natural capabilities for defence, would strongly indicate it as having been the centre point of the original town which grew into the Burgh of Aberdeen; and this seems to be almost made certain from the fact mentioned by Mr. Gordon, that in his day the ruins of the old Tolbooth were to be seen close to the shore on the west side of the hill.

The Crofts of the Burgh form the next notable territorial division. They form a complete zone around the inhabited town. Their outer boundary is exactly known; and their inner boundary around the inhabited town is also distinguishable, and has been already described. These Crofts had in course of time each acquired a distinctive name and a fixed outline, so that before they were built upon any man ac-

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quainted with the town and its affairs could have pointed out the position and boundaries of each of them. Even now, although they have almost all been laid out in streets and covered with buildings, so that their original boundaries are obliterated, it is possible to distinguish them by examining the old title deeds of them and their various sub-divisions. A little over thirty years ago it was found desirable to have them so traced out and identified, and the task was committed to Mr. John Stuart, now Dr. Stuart, and the late Mr. William Duncan, treasurer of police of Aberdeen. Both these gentlemen were well qualified for this work by their general antiquarian and special local knowledge. A blank map of Aberdeen was given to each of them, and working separately, and having access to abundant materials, they each produced a map of the Crofts completely filled up; and on comparing the two maps thus separately constructed, the results were found to be practically identical. These maps are in the Town's charter-room, and their publication would, I believe, be found exceedingly interesting.

The outer boundary of the Crofts, commonly known as the Town's Inner Marches, is described as follows in the later records of their periodical visitation and perambulation, viz., by a line commencing at the influx of the Ferryhill Burn into the river Dee, then holding up the said burn of Ferryhill to the east boundary of Damhead or Union Grove, turning up by the Justice Mill dam, and crossing the Skene turnpike road, leading from Union Place, and keeping along the east boundary of the lands of Rubislaw to the branch of the Skene turnpike road, which leads from Skene Street and the Schoolhill, thence crossing this branch of road and including Cherryvale, Hardweird, and the late Robert Mackie's property, to Jack's Brae, by a small lane from thence turning towards the town by the road leading to Jack's Brae, and including the buildings from the house sometime occupied by William Reid on the north side of said road, and running along the north boundary of the ground connected with the said buildings till it reaches the enclosing wall of the property occupied by the Gilcomston Brewery Company, then keeping along that wall to a march stone at the gate leading to the Mill of Gilcomston, and passing through the kiln connected with that mill, and by a march stone till it reach the mill-lead or burn where there is another march stone, and along the back course of that burn by the Steps of Gilcomston, including the works used as a distillery by the Gilcomston Brewery Company, to a point opposite the gate leading

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to the Broadford Works, from this point, nearly in a straight line, to the point where the Burn of Broadford crosses the burn coming from Froghall and Causewayend, thence up the course of the last-mentioned burn to the Aberdeenshire Canal, at a point a few yards southwards of the canal lock, at or near Froghall, thence across the canal, and in a line to a march stone of the town of Aberdeen, marked No. 61, and from thence in a straight line to a march stone on the east side of the Spittal Road, near Love Lane, marked No. 62, thence eastward along the south boundary of the Spittal lands to the Old Town Links, and then turning northward by the east boundary of the Spittal lands, and along the Old Town Links, till it joins the Tyle Burn, and keeping along the said burn to the river Don, then along the Don to the sea beach, and along the sea beach to the mouth of the Dee, then crossing it and keeping along the flood-mark on the south side of the river to the Craiglug, and there crossing the Dee and keeping the course of that river eastward to the point of commencement at the burn of Ferryhill.

In the old infeftments and other deeds contained in the records, pieces of ground lying within the old Burgh are described in some such manner as the following, "lying within the Burgh of Aberdeen," "at the east-end of Castle Street," "in the Netherkirkgate of the Burgh," "in Castle Street within the Burgh," "in Shiprow," &c.; while lands lying among the crofts are generally described in such manner as, "in the east part of Aberdeen," "at the north end of the Burgh," "within the liberty of the Burgh," "in the territory of the crofts of the Burgh," "in the east territory of the crofts of the Burgh," &c., but occasionally they are described as "in the Burgh." As already noticed, Futty seems to have been a distinct townland, probably under the jurisdiction of the Burgh of Aberdeen, and to have been gradually incorporated with it. Lands lying in that quarter are variously described as "in the territory of the crofts of Futty" (1490), "in the burgh in Futty" (1503), "in Futty" (1503), "in the territory of Futty" (1528).

From these descriptions I think it is to be inferred that anciently the territory of the crofts was regarded as truly part of the Burgh, that the built and inhabited district had in common speech come to be generally mentioned as "the Burgh," and that the various styles of description quoted above had been adopted, not in any strict technical sense but only for convenience and distinctness.

The next great division of the Burghal Territories comprehended

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the Forest of Stocket and the lands of Rubislaw and Cruives. Their outlines were called the Outer Marches, and are thus described in the records of their periodical perambulations. As these records are not published, the length of the following description of a riding of the marches two hundred years ago, with all its incidents, will be compensated for by the interest attaching to it :—" 2nd August, 1673.—The said day the provost, baillies, and certaine of the councell, accompanied with certaine of the brethren of gild and deacons of the craftsmen of airt, skillfull and expert in the tounis utter marches, conform as they had been in use to be ridden yeirlie past memorie of man, conform to the Acts of Parliament, the burrows being convenit at the Womanhill, past, visite, red and perambulat the utter marches and borders of the comon lands of Aberdeen and freedom thereof, distinguishing the samen from outlands, lords lands, lyand and marchit contigue togither; and first bygane and took up their first march as the samen was wont to be taken up of old at ane march stone at the south side of the Justice Milne burne fornent the nuik of Collie's croft, contigue to the east side of the king's gate, called the Hardgate, passand to the Bridge of Dee at ane great stone, at the south side of the said gate markit with ane sauser, which stone was fund to be in its right stance, and that the new house latlie built be Ferrihill wis rightlie observit; and not upon the highway or within the march, and therefrae red in the said gate upon the south syde of the house called the halfpennie house and cornland at the back thereof on the west, north-north-west of the said house and gate to belong to the towne of Aberdeen as propertie as many years before has been fund, and made interruptione by taking of certaine diwats of the said houses, and cutting certaine of the said cornes, and therefrae red on the said gate directly as march of propertie to ane house possesseit by Magnus Keith, on the north-west of the said gate forgainst ane little myre sicklyke upon the tounis propertie and made interruptione as aforesaid: And therefrae red in the said gate as march of propertie to ane place where ane smiddie wes buildit and stood of old at the edge of ane strype wher ther is ane march stone markit with ane sauser: And holding up the way to certain housses situat and built together be Ferrihill and his tennents, called Couperstoune, fund the said houses to be built upon the touns propertie, and made interruptione throf as aforsaid. As also of certaine corne land benorth and beweist the said housses in manner forsaid; and therefrae to ane stone beside Couperstoune

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markit with ane sauser at the head of the myre in the hieway, and bewest the samen betwixt the land of Pitmuckstone had incroatched upon the loaning by making corne lande thereon, and made interruptione and appoynted ane stone with ane sauser thereon to be infixed at the head of the rigg, going lineallie therefrae doune the dyke upon the syde of the said corne lande: And frae the said march stone in the myre holding up the strype to ane moss called Segiden, and fund in the way certain holes made be mortar leaders: And appoynted them to be convenit and convict: And keeping the said gate southerlie or thereby to Collilaw to ane great craigstone markit with ane sauser. Fund certain clods casten in the muir beyond Segiden be the tennents of Ruthriestoune, and made interruptione and ordinit them to be convenit: And from that Craigstone to ane great witterstone in the muir, markit with four holes wher ther is ane cairne set; and from that to the fuird called Leslie's fuird, wher ther is ane stone set and markit with the toune of Aberdeen, their letter P. for propertie, wher ther is ane cairne upon the east syde of the fuird: And remitting the marches betwixt the tounes commontie and the barronie of Pitfoddels to the report of the visitors appoyntit for that effect, past to the Cult gate keepand the said gate to the dame of Pitfoddles, wher ther stood ane uther march stone of old, markit with the syne of sauser haiving four witter holes: And ordainit the sauser therein to be deeper engraven: And ane sauser to be made on ane stone upon the south syde of the burne a little beneth the dam: And frae the said milne dame to the black hill of the Cults, where there is ane great march stone upon the brow of the hill, haiving in it four witter holes: Ordainit ane sauser to be engraven therein: And therefrae direct south-wast to ane great witter stone besydes Bells walls, haiving thrie holes on the syde and ane on the top, and ordainit ane sauser to be made therein; and therefrae keepand the nether wall heids south-west or thereby to the head of the Den of Murthill, wher there is ane great sauser stone upon the south syde of the muire at the head of the said Den: And finding the marches betwixt Bells walls and the head of the Den of Murthill not cleir, in respect some of the march stones had been tackin out, ordainit for better clearing thereof in tyme coming ane stone lying besouth Bells walls, a little above ane strype, and ane little rock therein with ane pair of butts to the said stone to be markit with ane sauser for ane marck in all time comeing as being in the direct way according to the former perambulations to the said head of the den

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of Murthill, and frae said march stone at the said head of the Den of Murthill towards the weather Craig, and finding ane march stone at the head of the said den of Murthill too farr distant from the march stone at the weather Craig, appoynted ane great stone to be markit with ane sauser, and infixed upon the top of ane round hillock or know about midway betwixt the marches, upon which hillock ane cairne is set: And from that to the Weddercraige where there is ane stone markit with the syne of ane sauser: And from the said Weddercraigge, north-west or thereby, to ane great cairne on the Brunt Hill markit with the syne of ane sauser: And therefrae descending doune the said Brunt Hill north or thereby to ane sink at the south side of the reisk and that part of the said sink forgainst ane great craige on the south side of the sink; and fund that the laird of Culter, younger, or others by his command, hade brunt and taken of ane sauser of ane great stone march to the south side of the brae; and ordainit him to be legallie pursewit therefor; as also he or his tennents had casten peits upon the contravertit reisk; made interruptione as aforesaid: and keepand the sink from the craige forsaid while it enter in the burne callit the burne of Brotherfield, at that part of the said burne wher ther is ane great gray stone standing on ane hillock on the north side of the said burne, distant therefrae ane halfe pair butts or therefrae descending doune the said burne wastward, and keepand the midst of the reisk of the just and equal half thereof to be on the south side of the said burne, which sall belong to the lands of the lasts pertaining to Culter; and the other half of the said reisk to be on the north side of the said burne, which sall belong to the lands of Brotherfield and Gairdaine of the freedome of Aberdeen till it come to the fuird of the said burne, under the hillock wher the houses stood of old biggit be James Gordon, and sumtyme possesst be John Gordon of Craibstoune, then called the Lasts, on the north syde of the which fuird the lands of Ord, belonging before to the Earle of Marischall, and now to James Raskine, and the lands of the freedome of Aberdene. And fund that at the rottin the relict of Alexr. Forbes, in Brutherfield, hade made corne land of about ten pecks sowing, and ordainit her to be convenit and convict thiranent, and inhibite to labor the same in tyme comeing as being moss ground: And in respect the perambulators of the said utter marches have been always heirtofoir necessitat by reason of the unpassibleness of the way ouer the burne and

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thorrow the maresh to keep the south side of the said burne and maresh, and to ryde and perambulat upon the lands belonging to the said laird of Culter, younger, which was not only much out of the ordinarie way, but also wes inconvenient for preservatione of their priviledges and libirties in that effair. Therefor fund it very expedient and comodious that ane calsie suld be built with all convenient diligence thorrow the maresh be east the Catcraig, to the effect the said visiters may have frie passage and ryde upon their awin bounds; and that the dean of gild as thesaurier deburse the expenss thereanent which sall be allowit in their accompts, and Captain Dalgardnoe or any others the Councell sall appoynt oversee the cairfull makeing up of the said wark: And therefrae to the ringand stone by and on the west syde of the meadow of Brutherfield contigue to the brae of Ord, within the which meadow the relict of Master William Davidsone, and the said James Raskine now her husband, had sowine ane quantitie of bear and oats, whereof ane pairt cuttit and made interruptione, and frae the said brae of the Ord, keepand the saugh betwixt the meadow and the brae whill it come to the burne, fund that the relict of the said Alexr. Forbes of Brutherfield had made corne land of Bruntland, upon the moss at the muttons snell close to the bridge of the moss; as also that Thomas Milne in Auchlie had made some corne land of moss ground near to the Bishop's dame; as also that he had plougheit some moss ground upon the burne syde at the same place; as also that the said relict had made corne land of moss ground, about six pecks sowing, upon the skirt of the moss of Brutherfield; as also that the rind of the moss wes castin; as also that Gilbert Mackie had laborit the end of four riggs of moss ground under Long Cairne, and ordainit the said Thomas Milne to be convenit and not to come further out upon the moss in time coming; and that the said plougheit land ly unlaborit, and that the said relict labour not neir the moss by the length of ten oxin: And holding up and keeping the said burne to the fuird forgainst the houss of Brediauch, quhilk burne in certaine places the tenents of Kinmundie heid put out of its old track upon the lands of Kingswalls, and going up the said burne towards the rock wall of Kinmundie, ffand that the tenents of Kinmundie had castin great quantities of peits in the mosses of Borrowstoune, belonging to the toune of Aberdein, and made interruptione by cutting certain of the peits, and ordenit the burne to be castin by ane streight lyne thorrow the midst of the moss to the rock wall, and from the

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said rock wall till it come to the first march betwixt the toune and the at the inver of the said burne, where the samen enters in the Black burne, which Black burne devydes the lands of the Freedome from the lands of Easter Kinmundie and Auchinleck, pertaining to the Earl of Marischall, at that part of the said Black burne where ther is ane greit mortar swell on the south syde of the said Black burne, direct forgainst and anent the said inver, at which inver of the said Black burne ordined ane stone to be unfixed for ane march, markit with ane sauser, and set ane cairne thereat, and ascending and holding up the said Black burne as the same goes north-eist thereby, ever keepand the sink and the said Black burne at the south side of the hill called Eldrick Hillock, whill it come to the heid of the Bluid burne wher there is an little moss, and therefrae immediately thorrow the midst of the said mosses, as the same is carneit (marked with cairns), whill it enter in the Garlok burne, and descending doune the said Garlok burne eist or thereby, as the samen runes betwixt two hills whill it come to that part of chapman road where it crosses the said burne, in which burne, at the pairt forsaid, there is ane cairne and ane march stone markit with the seyne of ane sauser, and therefrae to ane great march stone in the myre in the north syde of the hill of Brimmond, which was ordainit to be deeper engravin, at which stone there wes ane cairne set, and therefrae holding and keepand the said chapman road whill it come to ane great march stone, markit with P. for propertie, and finding that the possessors of the green well tree had made corne land without the boundes, upon the tounis freedom, made interruptione by cutting of the said cornes, and turneing in again to the said hiegate ; and keepund the said chapman rod east or thereby fund that Alexander Edward had made up certaine houses on the freedome, and that beeist the said houses there wes certaine corne land made be him on the freedome, and made interruptione, and apoyntit Mr. James Sandilands of Craibstoune to be insistit against for production of his evidents for cleiring the marches betwixt the toune and him, as also for breaking ane sauser of ane march stone in the way of the chapman rod, or some other to his knowledge ; and keepand the said rod whill it come to the fuirde of the cross burne besouth the which rod the tenants of Cuparstone had castin peits and sowin cornes within the mosses of Keplehill and made interruptione, and apoyntit march stones to be infixed on both sides of the said chapman rod, markit with the signe of sauser, of com-

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petent distance from uther, preserving ane hieway and rod all along of fourteen foots of breadth, and croceand the burne and keepand the march rode, stone be stone, as they are markit with the signe of the sauser thorrow the cross of the Wagley whill it come to ane stone markit with an sauser on the bank of the Bucks burn, on the west side thereof, abune the old dame and fuird of the samen, and appoyntit ane stone to be fixed and markit with ane sauser, at the fuird on the west syde of the burne, as ane of the town's merches and that cairnes be set about the merch stones on the chapman rod for better knowing thereof, and frae the said sauser stone croceand the said burne, and keepand the said dyck eastward to the auld dyke of Auchmull, whill it come to ane march stone by and on the north syde of the gate and keepand the said gate to ane march stone on the east side of the burne, within ane quarter of pair of butts or thereby thereto, and holding therefrae, holding down the burne, while it enter the water of Done, and holding doune the water of Done whill it come to the old found of the dira dyck, which dyck the tenents of Hilltoune had broken doune and apoyntit the same to be made up, and holding the said dyck southward while it come to the craighead, where there is ane march stone markit with ane sauser, and therefrae keepand the said dyck whill it come to the teiled land of Caponstone, wher it was thought the old kill of Caponstone stood, and there fund that the tenents of Caponstone hid manured and taken in ane fauld of land upon the touns freedome without the march, and made interruptione, and holding down the laich eist or south-eist, or thereby, betwixt Collistouns dyke and the lands of Caponstoune to the fuird above Picktillum, callit the Kings fuird, besouth which dyck it wes fund that the tenents of Caponstoune hade taken in and made corne lande of ane great piece of the freedome, and had riven out new ground to ane considerable number of bolls sowing, which wes apoyntit to be taken of to the tounes common good, besouth the march stone on the hieway, which was found and ordenit to be markit with ane sauser as the march in time coming, and made interruptione of the cornes upon the said land, and therefrae keepand the said gate to ane merch stone in the Den called Kettiebrauster, markit with ane sauser and key, and therefrae keepand the north-eist gate, staine be staine, as they are markit with sausers, thorrow the croft of Pictillum, in the midst of which croft there is two merch stones markit with Saint

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Peter's key, which in respect of the corne land could not be found, and appoyntit the said stones to be sought out and markit for merches in tyme coming, and therefrae, stone be stone, over the south end of the Spittell hill, as the same is markit with stones markit with the sauser and key, whill it come to the Gallowes Slackes, and ane eirdfust stone ther markit with the said sauser and key; and ordainit all comone loaning betwixt the land of Saint Peter's Hospital and the toune of Aberdeen which is found to be teiled and labored to be taken notice of, and ane loaning to be reservit, and merch stones accordinglie to be set; and therefrae doune the north side of the great snaill to ane strype called the Bansticle Burne, and fund that Mr. William Moirs tenents had built ane dycke alongst the land ends, and made interruptione; and therefrae keepand the said Bansticle Burne, as the same runs in the salt sea, and therefrae keepand the sea shore all along, under the blockhous and under the toune of Futtie and up the new shore, came to the Keyhead and upmost croune of the said burghe: Whereupon, and upon all and sundrie the premises, Alexr. Bennet, dean of gild, for himself, and in name of the Provest, Baillies, Councell, and communitie, asket and took instruments."

This line does not seem to include the river Dee beyond the Craiglug; but under the charters before mentioned it is believed and held that the Burgh itself, the ancient Burgh, included the river and fishings as far as the Bridge of Dee; and it is evident that this is not mentioned in the perambulations, simply because the river itself was a well-known and reliable landmark which no encroaching neighbour could shift or remove.

When the Town some years ago feued out the last remaining lot of what was called the Commonty of Whitemyres, there remained of the unappropriated common land of the Burgh, only the Links. These lie within the territory of the Crofts as has been already shewn; but from the nature of their soil, they have always necessarily lain waste, and are now by use and wont prescriptively appropriated to the recreation of the inhabitants.

I have shewn that the Burgh lands, including the territory of the Crofts, the forest of Stocket, and the lands of Rubislaw and Cruives, are all held in burgage tenure of the Crown; and, therefore, we might expect that all the component parts of these lands should be held in burgage tenure of the Magistrates as the Baillies of the Crown; but it is not so. All the lands outside the inner marches

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are held in feu of the Burgh, and the authority for this has been explained. But a considerable part of the lands lying in the territory of the Crofts is found to be held in feu tenure without the Magistrates being acknowledged in the holding at all; and this fact has given rise to a good deal of speculation and discussion amongst lawyers. Some have held it to be altogether an irregularity, and radically illegal. Others have supposed that it proves those feu lands not to have originally belonged to, or formed part of the Burgh. But the true explanation is to be found in the fact, that the feudal system of land tenure and its practical details did not spring at once into a complete and organised existence, and that at one time the distinction between feu and burgage tenure was not a real and important one, as it afterwards became. When the first charters to our Burgh were granted, there was no such thing in existence as a feudal tenure. The germ of the Burgage tenure then existed, but it was confined in its operation to the built and defended roods of the Burgh. These were held in free burgage—which meant simply that they were within the Burgh, that their holders were freemen, that they had the mercantile privileges of free burgesses, and that they were bound to fight for and defend the Burgh. At that time the word "feu" in our acceptance of it had no existence. The word "fee" is probably one of extreme antiquity, meaning simply treasure or value, and it was then used to express the right which that man had in any piece of land who paid scot or land tax for it, the "malar" or payer of mail as he was called, as distinguished from the right of its tenant or "few-fermar," that is of the man who farmed or rented the fee. It was also applied to lands held in burgage to express that the community, and none else, had right to the fee of the lands. Thus King Robert I., in his charter of 1320, gives to the burgesses of Aberdeen the Burgh and the Forest of Stocket, "ad feodifirmam," which at that date I take to have meant "for the purpose of farming out the fee of it," in terminable tacks or leases, and certainly not in feu-holdings as understood in more modern days; and further the charter bears that it is to be held by them, "in feodo et hereditate et in libero burgagio;" which means that the property was held in fee or feu, in the sense above explained, and also in free burgage. This mixing up of the terms since appropriated distinctively to feu and burgage tenure is quite common in old deeds, and proves that there was then no idea of their being contradictory or inconsistent. Thus in 1492,

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David Wauss, vicar of Banff, gives a charter to John Chamer, of some crofts in Aberdeen, "to be held *from* me and my successors *of* our Sovereign Lord the King, in fee (feodo), and heritage and in free burgage . . . rendering thence annually, the said John, his heirs or assignees to our Sovereign Lord the King, burgage service for the said crofts used and wont as much as pertains to the same; and paying to the said David Wauss" and to others, certain sums of money. And again in 1528, John Wauss, chaplain, gives to John Wauss, of Many, a charter of a croft in Aberdeen, "to be held *from* me, my heirs and assignees *of* the Lord of Saint John, preceptor of Torphiching, in fee and heritage, and in free burgage." Both these charters are recorded in the Burgh Register of Sasines of Aberdeen, and these are specimens of deeds, no doubt perfectly valid and regular in their construction, which exhibit lands held both in feu and burgage. To non-professional readers it may be well to explain that the character of these holdings as "feus" is not fixed, and does not depend upon the accuracy of my interpretation of the words "in fee" (feodo), but is certainly determined by the characteristic use of the words *from* and *of*.

The rest of the explanation is easy. In course of time the development of the practice of feudal conveyancing brought it about that it was held necessary that lands held in burgage-tenure should be held through the hands of the Magistrates as the King's Bailies, and not of the King directly, or of any subject superior. What then was to be done with lands held in both ways? Probably some conveyances dropt out the feu, and held to the burgage-tenure; but it is certain that many had dropt out the burgage and held to the feu-tenure. Next arose an idea that the Burgh Register should contain none but burgage-holdings, and the County Registers none but feu-holdings; and when subsequently this was made imperative by an Act of Parliament, the distinction between the two manners of holding was changed into a reality, and there was no longer a choice between them. Those that were held in feu at that date must remain so; and those that were then held burgage must remain burgage.

I am unwilling to declare my sketch finished while those remarkable words in the charter of King Alexander II., about "other burghs and burgesses within the bailiewick of Aberdeen" remain unexplained; but as I cannot explain them, I have no choice. It may be noted, however, that at that period charters contained few superfluous words, and that whatever they did contain was put there for a purpose.

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These are not words of style, nor are they there merely to fill up space. They are most unlikely words for such a purpose; and they seem fully and distinctly to infer that, besides the settlement known as the Burgh of Aberdeen and its body of burgesses, there were, or recently had been, other settlements known as burghs, and other bodies of burgesses, within a district or jurisdiction known as the bailiewick of Aberdeen. It may be that Futty was one of these. It may be that the Burgh of Aberdeen, as then recognised, was composed of a group of settlements which previously had been separate burghs, and were then only recently fused, or were in the process of fusion into one. But I am of opinion that if we could obtain a glimpse of things as they were—say when Columcille and Drostan came to Deer, we should find that a large space between Dee and Don was under the jurisdiction of a Bailie-Mor, whose seat was near the mouth of the Dee; and that in course of time Gilcomston, Seatown, Cruives, and Old Aberdeen had become detached from his jurisdiction. The two rivers near their mouths form so convenient and complete boundary lines that one can scarcely believe that the space enclosed between them had not formed one jurisdiction. But as the disjunction of portions of such a jurisdiction, say in the tenth or eleventh or twelfth centuries, would probably have been altogether in the King's discretion, and had involved no graver questions than giving some compensation or equivalent to the Magistrate whose territory was diminished, so the operation would leave little trace behind it. Only one recorded fact has come under my notice which seems to give evidence of the theory that the bailiewick had once comprehended Old Aberdeen, and it is a fact very circumstantially and distinctly related. In the Council Register of Aberdeen, under date 1st March, 1530, the following is recorded:—"The said day, William Lyon, balze to my lord of Abirdene (*i.e.*, The Bishop of Aberdeen), asket lycens at William Rolland, ane of the bailzeis of this burcht, to hang ane thief, quhilk was convickit in my lord of Aberdens Court, quhilk lycens the said William Rolland grantit, protestand that it sald nocht hurt the townis privilegis in na sort." Now the Bishops of Aberdeen from the time of the first Bishop Nectanus in 1134, were Barons in respect of their proprietorship of the "vill of Old Aberdon," besides a number of country parishes; and in 1164 the Kirk of Saint Nicholas of Aberdeen was added to their Barony. Within the bounds of these possessions their baronial jurisdiction gave them right to try thieves and other criminals; to

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doom them in certain cases to pit or gallows, and certainly to carry their sentences into execution. In this case therefore it is a puzzle to say why the Bishop, if this thief was convicted in his own court, within his barony, for a crime committed within his jurisdiction, should ask leave of the Bailies of Aberdeen to hang him; and the only explanation that suggests itself is that the Bailies of Aberdeen being the King's Bailies, and therefore of higher judicial rank than the Bailie of a Baron, may have once had jurisdiction over the town of Old Aberdeen; that this jurisdiction had never been expressly taken away, and that there had remained a traditional belief and claim that their criminal jurisdiction still extended over the whole of the ancient bailiewick. This question of the extent of the ancient bailiewick of Aberdeen is interesting; and, as I said before, much research might be necessary for its complete investigation.

We have now examined and beat the bounds of each of the three great divisions of the territories of the Burgh of Aberdeen—the Town, the Crofts, and the Forest—and although we have, as it were, seen the town outgrow its bounds, and overflow the field, and encroach on the forest; although the distinctions between the three are now in fact practically blotted out and abolished, we see that they are clearly traceable, even as they were "in days of yore, when Robert rang." As to the nature of the right which a Burgess had in his rood of land within the town, we cannot see back to the time when no hereditary title was acknowledged, if such was ever the case; but we see that even within our historical period the Burgess held his rood under conditions, viz., that it should be "biggyd and defendit," and by several enactments of the old Burgh Laws we find it declared that a man may sell land got by "conquest" (*i.e.*, purchase) freely, but that if it came to him by inheritance, he may not sell it without first offering it to the heir; by which it would appear that the right of inheritance had been recognised and allowed earlier than the right of purchase. As to the right allowed in the Crofts we have clearer knowledge. Although they seem to have been the subjects of free sale and gift as far back as our land registers go, we nevertheless see that in theory such alienation was illegal, and that they were held to be in theory, part of the inalienable common property of the Burgh. Thus when, so late as the year 1559, the Magistrates meditated laying out some farther space for building about the higher part of the Schoolhill, they deemed it necessary to seek, and they obtained, a dispensation and license from the King to

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lay out building grounds, not for that particular locality only, but also for "onie pairt of the stretis, wayis, or common gaitis of our said Burgh of Aberdeen, or round about the samyn," and also a condonation and ratification of all former alienations, and a renunciation and discharge of "all actioun, criminall and civil, quhilk we or our farsaids may have againis theme for setting out of the pairtis before mentioned, or ony portion thairof." The Burgh with its Crofts was under a code of laws peculiar to Burghs, which constituted them military strongholds, and also the nurseries of commerce, and to some extent refuges for the oppressed. The nature of the right allowed to the occupiers of the Forest is still clearer. Until 1551 no part of the Forest was alienated from the community to private hands. It had been given by King Robert Bruce to the Burgh "*ad feodofirmam*," and those who knew best what that expression was intended to mean interpreted it to the effect that only leases of moderate length were granted of its surface. In the last-mentioned year, however, Queen Mary, on a representation that strangers having no business or interest in the Burgh were in the habit of acquiring those leases, granted a licence to the Burgh to feu out these lands in perpetuity to Citizens and Burgesses, under certain restrictions, which were afterwards removed. Till the Forest Laws gradually fell into desuetude, our Forest of Stocket had no doubt been governed according to those laws like the other numerous Royal forests in Scotland, whereof there seem to have been seven in Aberdeenshire, viz., Stocket, Dyce, Kintore, Benachie, Drum, Birse, and Braemar.

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APPENDIX.

NOTE A.
KING DAVID'S CHARTER OF DATE 1134.

I find, too late for remarking upon it in the text, that grave doubts exist as to the authenticity of this Charter; and yet, even if these doubts are well-founded, they do not affect its value for the purposes for which it is here cited. Whether it be authentic or not, it was in existence, and is noticed by Boece, about the year 1400, and was believed by him to be genuine. This, therefore, carries its existence back to five hundred years ago, and probably a good deal further. The objection to it is that its form and the mode of its authentication were not in use in 1134; but there seems to be no improbability that in all its substantial elements it may be such a Charter as might have been granted by King David in 1134. It is not probable that an absolute forgery would have been executed and promulgated and received as authentic, between its alleged date and the days of Boece. The truth is supposed to be that the substance, and perhaps the very text, of the original Charter have been re-written, without any real or intended fraud or forgery; and we must keep in view that at that early date much more respect was paid to the rights conveyed or confirmed by charters than to the documents themselves.

NOTE B.
NAME OF ABERDEEN.

By an authority too good to be slighted I am advised that the name of the Dee is not improbably derived from a Celtic word meaning black or dark, and the name of the Don from another Celtic word meaning green; and that these distinctions had been suggested by the generally green aspect of the woods and haughs of Donside as compared with the brown heath-covered surface of the valley of the Dee.

NOTE C.
THE KIRK OF OLD MACHAR.

The ancient tradition that Saint Columba sent a missionary to the north-east coast of Scotland with instructions to look for a river whose windings near its

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mouth took the form of a crozier, or shepherd's crook, is generally regarded as incredible, because we assume that there is implied a miraculous or prophetic element in the saint's instruction; whereas if we assume instead that the place had either been seen previously, or exactly described to him by some one who had seen it, the tradition ceases to be in any way improbable.

NOTE D.

MERCHANT GILD.

The Charter of King Alexander II. first specially recognises the existence and rights of a Merchant Gild. We have not, in modern history, any more curious fact than the existence and persistent continuance of this institution. No doubt the government of towns by an alderman and bailies was very ancient; but the existence and authority of the Merchant Guild seem to have been at least equally ancient. These Guilds are said to have originated amongst the Scandinavian races, and to have had for their object the organisation and management of both warlike and mercantile enterprises. They are also said to have made a special point of nourishing sociality and abundant drinking. They naturally consisted of the most wealthy and influential members of the community, and therefore of those best fitted in these times to have the direction of local government. It was also a necessity of those times that the alderman, bailies, and Town Councils should be made up from the same class as the Guild. Any conflict between the two bodies would have been inconvenient, and ultimately destructive of the weaker. But both bodies were strong, and their interests were identical, and therefore they managed to agree, and divided the government between them. The Guildry was the body from which the civic dignitaries were usually chosen, but while the Alderman or Provost was the chief man of the community, the Dean of the Guildry held only the second place. The Dean of Guild came to be the officer at whose instance all the Burgh Laws were put in force, and all penalties and forfeitures sued for in the Burgh Court. Bailie Skene, in his Memorials, tells us that he was the Procurator-Fiscal of the Burgh. In course of time, however, he seems to have risen from the office of Procurator-Fiscal, and to have assumed the office of a judge, while a paid official took the initiative in suits brought before the Burgh Court. Afterwards the functions of the Dean of Guild and those of the other magistrates came to be separated, the Dean confining himself to purely mercantile affairs and certain questions of boundaries and building; the magistrates taking cognisance of other matters. The comparatively recent abolition of trading privileges took away a large portion of the Dean's work; but at the same time his establishment in the second place in the Town Council left him in a position of honour and influence not inferior to that which he occupied when he first appears in history; and however abhorrent his continued existence and exaltation may be to advanced liberalism, we find him vindicating his right to exist, and holding his enemies at bay, by the best of all defences, viz., usefulness and zeal for the public good.

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The following is a copy of the Burger's Oath, as used in the time of Queen Anne :—

Follows the BURGER'S OATH, to be sworn by all BURGESSES of GILD, and CRAFTSMEN of the Burgh of ABERDEEN the time of their Admission.

I Do solemnly swear in the presence of *GOD*, that I presently own, profess and shall adhere to, and maintain the true Reformed *PROTESTANT RELIGION*, denying the Heresies of *Popery* and *Quakerism*, and if I shall at any time hereafter (as *GOD* forbid) Apostatize from the said *PROTESTANT RELIGION*, by owning or professing *Popery* or *Quakerism*, I hereby Renounce all Benefite and Priviledge competent to me as BURGES of ABERDEEN, alike as if I had never been admitted thereto.

I Do sincerely Promise and Swear that I will be faithful and bear true Alledgeance to Her Majesty Queen ANNE.

I Do solemnly Swear that I shall be obedient to the just and good Government of the said Burgh of ABERDEEN, and shall to the best of my power maintain and preserve the Peace and all the due Priviledges thereof, and particularly,

I. I shall be leall and true to the said Burgh and Freedom.
II. I shall never skaith their Wares.
III. I shall forsee their profit, warn them of their skaith, and stop it to my power.
IV. I shall obey the Magistrats and their Officers in all things Lawfull.
V. I shall Vote no Person to be Provost, Baillie, nor Counsellour of this Burgh, except Burgesses and actual indwellers within the same.
VI. I shall give leall and true Counsell and advice, when it shall be asked.
VII. I shall conceal the Counsell and Secrets of the said Burgh.
VIII. I shall own no Unfreemen's Goods under Colour of mine.
IX. I shall Scot, Lot, Watch, Wake and Ward with the Inhabitants of this Burgh.
X. I shall purchase no Lordship Authority, nor Jurisdiction contrair to the Priviledges and Liberties of this Burgh, but shall maintain and defend the same to my Life's End.

So Help Me GOD.

Addition for *CRAFTSMEN*.

I shall keep my self within the Bounds and Liberties of the Indentur past betwixt the Brethren of Gild and Craftsmen of this Burgh the *Seventh* of *July*, *One Thousand Five Hundred and Eighty Seven*. I shall be lyable to, and obey the *TOWNS* Statutes.

So Help Me GOD.

NOTA, That all *Chirurgeons*, *Apothecaries*, *Litsters*, *Barbers* and Others, who are not incorporat among the ordinar Trades, Do at their Admission as BURGERS, Swear the forsaid *Oath*, except the Fifth Article thereof, because they are only admitted BURGERS in *Sua Arte* allennarly, and are not BURGERS of Gild, nor Incorporat as said is.

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NOTE E.
NAMES OF THE CROFTS.

Each croft had a name of its own, and the names seem to have arisen either from peculiarities of shape or size, as the Lyttel Croft, the Lang Riggs Croft, the Aucht Roods Croft, the Braid Croft, the Cruikit Croft; or from some building or other well known object of interest being on or near them, as the Angel Well Croft, the Dam Croft, the Ducot Croft, the Spittal Croft, the Cunninghairhills Croft, the Elfhill Croft, the Leper's House Croft, the Marywell Croft; or from some peculiarity of the soil or surface—as the Clayhills Croft, Fill-the-cup Croft, the Gutter Croft; or from some notable possessor of them as Barbour's or Edipingle's Croft, Collison's Croft, Coulli's Croft, Ymlay's Croft, Kynidei's Croft; while some of the names are not easily accounted for as Hardweird Croft, Sillieweird Croft, Sow Croft, Stanedeil Croft.

Sometimes the names of the Crofts seem to have undergone change, as in the case of Barbour's or Edipingle's Croft. It is not certain which of these names is the older, but the latter was certainly named after its possessor, about 1360—Adam Pringle, a member of the Royal General Council, and of the Committee of Dooms, a burgess of Aberdeen, laird of the lands of Baudifash, in Aberdeenshire, Knoc in Strathauchin, Longforgund in Perthshire, and Whitsun in Berwickshire. The latter was his principal family estate; but at the period above mentioned it had been forfeited by the English conquerers, and Adam Pringle sojourned in Aberdeen until Scotland again got possession of the Border counties, when he was reinstated in the lands of Whitsun.

Adam Pringle's son, Robert, built Smailholm Tower, in Berwickshire, about the year 1400. In 1388 he was armour-bearer or squire of the body to James, Earl of Douglas, at the battle of Otterburn, and held the same station about the person of Archibald, fourth Earl of Douglas (the Tyneman), and Duke of Turaine, whom he accompanied, when sent to France with 10,000 auxiliaries to the assistance of Charles VII., and lost his life along with him at the battle of Verneuil, in 1424.

Such are the legends to which a study of the antiquities of a burgh like Aberdeen leads the way; and thus we learn the quality of our old Burgesses of Guild.

The Scottish tongue, prone to the use of diminutives, seems to have converted Adam into Adie or Edie, and the scribes of the north country, at that period probably semi-Celtic, preferred to write Pingle rather than Pringle. The identity of the man is certain.

NOTE F.
MIXED FEUDAL HOLDINGS WITHIN BURGHS.

The writer believes that he has met with instances of land within a Burgh being held, not as Burgage, but as part and parcel of Baronies situated "outwith" the Burgh; but he is unable here to specify any of them. That such had often been the case, however, seems to be proved by Article VI. of Fragmenta Collecta, which is as follows:—"Item that the haill tenants of lands of a baronie within a burgh, aucht to be subject to the lawis of the burgh, and be corrected by the balyes anent brakand the asize price, and in all other causes and civil suits."

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NOTE G.

THE RIVER DEE FROM THE CRAIGLUG TO THE BRIDGE OF DEE.

A confirmation of the idea that the ancient Burghal Jurisdiction comprehended this part of the river has recently come to the writer's knowledge. The "Pott and Fuirds" salmon fishings, which occupy that part of the river, and which had, from time to time, within the last hundred years, been asserted to be within the Parish of Old Machar, and even the Parish of Nigg, are found to be described in the older titles as lying within the Freedom of the Burgh of Aberdeen, Parish of Saint Nicholas, and Sheriffdom of Aberdeen.

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March 4, 1879.—Sheriff JOHN COMRIE THOMSON, *President, in the Chair.*

ALEXANDER BAIN, M.A., LL.D., Professor of Logic in the University of Aberdeen, read a "Biographical Memoir of Dr. Thomas Clark."

THOMAS CLARK was born in Ayr, on the 31st March, 1801. His father, a man of singular energy, integrity, and circumspection, was captain of a merchantman, and, during a long career, sailed in every sea without encountering a disaster. His mother was also a woman of uncommon cast; she originated the well-known Ayrshire needlework. All the children that grew up to maturity were marked with strength of character in different ways. Thomas was educated at the Ayr Academy, a school then famous in the west of Scotland, numbering upwards of 400 pupils. The course of instruction was extensive and complete, including French, classics, and mathematics; and the rector (Mr. Jackson, afterwards Professor of Natural Philosophy in St. Andrews University) gave occasional lectures in experimental science. Clark was considered a heavy, dull boy; his progress was slow, till about 13, when he began mathematics, and became one of the distinguished boys of the Academy. He was fond of propounding school-boy schemes, and got the *sobriquet* "Philosopher Tom." Many men of eminence have proceeded from the same school.

In 1816 he went to Glasgow, and entered the counting-house of Charles Macintosh & Co., the inventors of the waterproof cloth. The main portion of the business of the firm at that time was preparing a material known as "cudbear," which was used as a scarlet die, more especially in the manufacture of cloth for the army. While Clark was still in the employment of the firm, they began the manufacture of the India-rubber cloth. Macintosh also, from a mineral found in the margin of the coal formation, created an extensive alum manufacture.

It was in this connection that Clark first had his mind turned to mineralogy and chemistry, and their applications in the arts.

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Although he often remarked that his training in the counting-house was of value to him in the diagrammatic representation of scientific facts, he was by no means an apt accountant, and he did not remain very long at the work. The Macintoshes discovered the true bent of his mind, and, on their recommendation, he obtained the situation of chemist in Tennant's Chemical Works, at St. Rollox.

In 1826 he was appointed Lecturer in Chemistry to the Glasgow Mechanics' Institution, having then left St. Rollox. About this date he began his career of original investigation. In the programme of his Lectures for 1826, he gave his table of chemical elements and formulæ, from which may be inferred the state of advancement of his views on the atomic theory and the theory of salts.

The following paragraph respecting his views on this subject was penned by Thomas Graham :—

"That theory of the constitution of salts in which they are represented as uniformly consisting of a metal or hydrogen united with a radical, simple or compound, no doubt originated in Davy's discovery of the composition of chloride of sodium ; and the credit of the generalization is generally ascribed to that philosopher. But it does not appear that Davy ever expressed the view in precise terms. In objecting to the rival view—of the presence of acids and oxides in salts like the sulphate of potash, and in illustrating his binary theory of certain other salts—he looked upon the former class as triple compounds of metalloids, metals, and oxygen. He admits, though with inaccurate numbers, that the atomic weight of hydrogen is 1, of oxygen 16, of carbon 12, and of sulphur 16 ; water being composed of two atoms of hydrogen and one of oxygen. But the new theory, particularly in its relation to the function of hydrogen in the hydrated acids, appears to have been first properly appreciated and fully developed by Dr Clark in his early chemical lectures of 1826. It was sagaciously applied by him to explain the proportion of acids in salts of peroxides, like sulphate of alumina, and was a manifest advance upon the canon of Berzelius, that the oxygen of the acid is always a multiple of the oxygen in the base. Dr. Clark also interpreted the atomic theory less rigidly than most of his English contemporaries, and more in accordance with modern views. He allowed portions of an equivalent to be represented, as $\frac{2}{3}$ Fe, the quantity of iron united with one equivalent of oxygen in the peroxide, which he could thus assimilate to a protoxide in

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constitution. He exercised also a free judgment in fixing the atomic weights of elements, and we find in his table of 1826, carbon made 12, and oxygen 16, in reference to hydrogen as 1."

In an early essay shown to friends privately, but never printed, he established the fact that bisulphate of potash consists of sulphate of potassium, combined with sulphate of hydrogen. Thence he assumed that all the acid salts are similarly constituted, for example, the bichromate of potash. On experiment, he found that this salt contained no hydrogen, and belonged to a class containing more than one equivalent of acid without the elements of water. He, consequently, lost faith in his theories, and shrunk from their consequences.

In 1826, he published his papers, entitled (1) "On the Pyrophosphate of Soda," (2) "On the Arseniate of Soda," and (3) "On a New Phosphate of Soda." Probably the most durable of Clark's contributions to chemistry is the discovery of the pyrophosphate of soda, considering the support given by that discovery to the then struggling doctrine of isomerism, and the important part played by the phosphoric acids in leading to the more recent ideas of polyatomicity. The establishment of so new and characteristic a substance as pyrophosphate of soda is likely always to hold a place in chemical history. Sir John Herschel, in his "Introduction to the Study of Natural Philosophy," pronounced this research as one of the most felicitous examples of a successful induction.

It was with a view to teaching chemistry in a medical school, and not to medical practice, that, in 1827, he entered the University of Glasgow as a medical student, and, after passing through the medical course, took the Doctor's degree in 1831. In 1829, he became apothecary to the Glasgow Infirmary. While in this office he made three contributions to Pharmacy: (1) On the Pharmaceutical Preparation of the Precipitated Carbonate of Iron; (2) A Chemical Examination of Singleton's Golden Ointment, with an improved formula for preparing the Red Precipitate Ointment; (3) On a new Process for preparing medicinal Prussic Acid. (Glasgow Medical Journal, Nos. 11, 12, 14.)

In 1832, he published, in the "Westminster Review," an exceedingly elaborate enquiry into the whole system of existing weights and measures. It attracted great attention, and the value of it is not yet exhausted. He had collected materials for a second

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article, which would have probably been full of curious interest, "On the Lost History of English Weights and Measures." Another subject occupied him for a considerable time—The Law of Patents, and on this he contributed two papers to the "Westminster Review," in 1834-5.

The Professorship of Chemistry in Marischal College having become vacant by the death of Dr. French, in October, 1833, Clark became a candidate for the office, which had to be filled up by competitive examination. The other candidates were Dr. Henderson and Dr. Laing. The examiners (Dr. Thomson, of Glasgow, the Rev. Mr. Forsyth, of Belhelvie, Professors Davidson and Skene, of Marischal College), reported in favour of Dr. Clark, and he was elected and admitted accordingly.*

As a chemical lecturer, he had strongly marked peculiarities. Applying his thoroughly original and independent mind to chemistry, as to everything else, he took nothing on trust himself; and it was his aim to bring before the students whatever doubts and difficulties attended the subject, and to exhibit the evidence, experimental or theoretical, for each position. He also paid great attention to the manner of stating and expounding his science. Instead of commencing with the generalities of the atomic theory, he described in detail a few of the leading elements—as oxygen, hydrogen, carbon, sulphur, stating, as matter of fact, the proportions of each in the several compounds, water, carbonic acid, &c., without making any references to the theory of combination. He next took up the atomic theory, and expounded it minutely, showing how far it was hypothetical, and how far an expression of experimental truth. Then followed the usual detail of the elements and their compounds, interspersed with discussions of leading points, as the constitution of the salts and acids, the theory of muriatic acid, the theory of the prussiates, &c. He devoted occasional lectures to leading processes in the arts, as the manufacture of coal-gas. His method of describing these was carefully studied, but was chiefly resolvable into the practice of starting from known and familiar elements, and showing how they became transformed in the course

*After the Examiners had reported in his favour, a hitch occurred, which nearly proved fatal. The conditions of the Chair require that the candidate should have a University Degree. Clark was an M.D., but several members of Senatus held that an Arts' Degree was meant. His admission was ultimately carried by the casting vote of Principal Dewar.

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of the operation to the more recondite products. Many of his students probably remember to this hour the manufacture of sulphuric acid, as depicted by him from his acquaintance with the works at St. Rollox.

There was what many parties considered a want of order in his course. He did not proceed by following out a systematic and exhaustive classification of the elements, as in an ordinary chemical text book. He rather selected important and typical bodies, making them the representative of general classes and doctrines. This was especially his way with organic chemistry, under which he merely adverted to a few important substances. Neither was he systematic in dealing with the chemistry of drugs; a few substances that he had thoroughly mastered being all that he took notice of. Indeed, system was never his strong point; he disliked the empty vagueness often disguised under a systematic array, and preferred the minute and thorough investigation of single and isolated facts. The accurate determination of any fact, however limited its place in a system, or even its utility, was always to him an intense satisfaction.

At the time of his going to Aberdeen, he had thoroughly investigated at least two subjects. The first of these was the theory of hydrometry, and the practice of hydrometer-making. The practical outcome was the construction of an instrument which at once gave, by its own readings, the true specific gravity, instead of requiring a calculation by a formula.

The other subject was the detection of arsenic. This he had studied with reference to the soda and mineral acid manufactures, and he had found methods of detecting the slightest quantities of arsenic in all the different products of these manufactures. At that time an account of these methods would have been of the greatest value; but he never prepared any paper on the subject. The practical results were the improved methods employed in his own laboratory for purifying the sulphuric and hydrochloric acids, and for testing arsenic in poisonings.

He took up the idea that the distinguishing characteristic of steel, and of the kinds of iron best suited for steel, was the presence of some foreign elements in small quantities. He supposed that one of these elements was arsenic, and another perhaps sulphur; and he was very sanguine of achieving some great results bearing on the steel manufacture from the experimental working out of this idea. His illness interfered with the prosecution of the subject.

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His practical turn of mind, and his experience in chemical manufactures, would have probably led him into extensive practice as a commercial chemist, had not his Aberdeen professorship removed him to a distance from the seats of the great manufactures. He acted for several successive summers as adviser to a chemical company in Staffordshire, but the business was interrupted by disputes among the proprietors.

In 1831 and 1832, Nelson, the discoverer and patentee of the Hot Blast for iron furnaces, had to defend his patent before the law courts against the Bairds, who had infringed it. Clark was employed in support of the patentee's case. This was perhaps the most important piece of business that had as yet been entrusted to him; and I do not doubt that his assistance contributed to the successful vindication of the rights of the patentee. In 1835, he published a paper explaining the principle of the advantage arising from the process; and usually introduced the subject when lecturing on Heat.

In 1836 appeared his letter to Mitscherlich, "On a difficulty in Isomorphism, and on the Received Constitution of the Oxygen Salts;" of which no notice was ever taken by the Berlin chemist. Although, in this paper, he still prefers the new to the old view of the salts, he speaks in very measured language, and considered that both ways must remain open to the choice of chemists, until some discovery be made, inconsistent with one, and compelling the adoption of the other; and he thought that the subject he was then considering would be found to yield the desired solution.

Clark is best known by his water tests, and his process for softening hard waters. The specification of his patent for the softening process (October, 1841) described the three tests employed —the soap test, the acid test, and the silver test. In a circular addressed to his "chemical friends" (1847), he entered into a more minute description of the tests for hardness and for alkalinity, but was embarrassed by the discordance of his own experiments to fix the degrees of hardness corresponding to the soap test measures. He did not get over the difficulty until, in June, 1849, when he had to report to the General Board of Health, on certain specimens of water proposed to be supplied to the town of Birmingham. He then found that the action of magnesia on the soap test was peculiar. At a certain degree of dilution, its hardening effect is partially disguised or latent, and is brought out only after further dilution. In one of

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the Birmingham specimens, the actual hardness of the water was 8·3°, while dilution brought out a farther hardness of 8·5°. This result suggested to him the true cause of the irregularity of his table of soap-test measures, namely, the presence of a small quantity of magnesia in the ordinary chalk waters. On preparing artificially a solution of carbonate of lime, he found that the correspondence of the degrees of hardness and the soap-test measures was exact and numerical throughout.

The softening process had been hitherto declined by the London Companies, although in the invention he had chiefly in view the water supplied by them. It was first applied at Plumstead, Woolwich; next at Castle Howard, the seat of the Earl of Carlisle; then at Caterham, Surrey; and recently at the Chiltern Hills; in all cases with perfect success. A Commission, consisting of Professors Graham, Miller, and Hofmann, in reporting, in 1851, to the Government as to "the chemical quality of the waters supplied, and proposed to be supplied to the Metropolis," remarked with reference to the process, "it is no longer possible to disregard the chemical means of removing hardness, or to represent them as impracticable on a great scale; they place the question of water supply upon an entirely new footing." I have heard Professor Graham say of the process that it was the most consummate example of applied science known in the whole circle of the arts. When the old London Companies refused to adopt it, a new Company was formed upon the express basis of supplying pure spring water from Watford, softened by Clark's process; but the political influence of the other Company, together with the adverse views of the Board of Health, which had a rival scheme to promote, prevented the new Company from ever getting their Bill passed; so that to this hour nothing has been done. The Government chemist, who reports periodically on the quality of the water supplied by the Companies, Dr. Frankland, has long advocated Clark's process; but in the meantime, the favourite idea is to revert to Wales or the Cumberland Lakes for a supply.

Clark was very much disheartened by the political combination whereby his process was kept back from its most suitable application, and when Lord Aberdeen was Prime Minister, he wrote a strong memorial setting forth the facts of the case, and requesting his Lordship's favourable consideration. I give an extract from this memorial, as a short specimen of his ordinary style of composition :—

"Fourteen years ago, communications I then had with the

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existing Water Companies satisfied me that, through them, there was very little chance of this process being adopted. It appeared to me that only new Companies would adopt it. Most unfortunately for the public and for me, Government took up the subject through the late miserable Board of Health. When the confidence of capitalists had been gained, and an offer was made to bring in softened spring water, your Lordship's Government gave direct opposition (the first direct opposition by any Government) to the project—among other reasons, because Lord Palmerston pronounced my process impracticable, although a scientific Commission, appointed by his Lordship's predecessor, had pronounced it expedient and practicable, to say nothing of the success of the process.

"It cannot be known to your Lordship, but it is known to me, that capitalists would have again proffered to Parliament to supply London with pure softened water, but for fear of opposition and loss by your Lordship's Government.

"It is a source of satisfaction to me that my poor efforts have made it a probability that London can be supplied with pure and soft water. The project sanctioned by your Lordship's Government would have been all very well thirty years ago; at the time it was sanctioned no competently informed person could doubt that it would lead to failure. I refer to page 25 of the enclosed report, where Thames Ditton water corresponds to the water sanctioned by your Lordship's Government.

"It has been a real misfortune to me to have interested myself in this improvement. I would not like to say to your Lordship how much of my savings it has cost me. Let that pass for nothing. The process is of such utility and such necessity to London, that it will, I have no doubt, be in operation when you and I have done with this world, and as long after as London lasts. I cannot persuade myself that your Lordship can consciously or intentionally stand in the way of such an improvement being introduced."

Lord Aberdeen asked him to an interview, and went patiently into all the circumstances; and would probably have exerted himself in favour of the new Company, or any other mode of getting the process fairly tried; but he did not find a suitable opportunity.

The Disruption of the Church in 1843 forced on the question of the repeal of the University Tests. For some time, it appeared as if

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the lay professors that had joined the Free Church were in danger of being deprived of their Chairs. At all events, the members of that Church were made alive to the injurious operation of these tests as regarded themselves, and were soon prepared to join in a movement for their repeal. Clark was opposed to tests on much wider grounds, and readily lent his aid to their abolition when the opportunity arose. In the winter of 1843, the question was taken up in the Senatus of Marischal College, and a series of resolutions condemnatory of tests was moved by Dr. Clark. In the preparing and correcting of these resolutions, he spent, as usual with him, enormous labour, and was, as I can remember, very much excited by the subject. They were a most masterly production in point of reasoning and style, and, besides being carried by a vote of 8 to 3, they were well calculated to impress people with the inexpediency of the tests. The counter resolution, supported by the minority of the Senatus, heightened, by contrast, the vigour of Clark's resolutions. Motions to the same effect were carried in all the other Universities; and the abolition of subscription very soon followed.

It was in the session 1842-3, that Clark first showed the symptoms of brain disease, from which he never afterwards was free. Soon after the new year he had to give up teaching his class, and excepting a few abortive attempts, he never lectured again. The following session, 1843-4 (the winter of the test resolutions), he came back to Aberdeen as usual, but his class was taught by Mr. Shier. Finding his case apparently hopeless, he was several years wholly absent from Aberdeen, and resided in his mother's house, first at Glasgow, and afterwards at Rothesay. So obstinate was the derangement, that his life was a constant series of headaches, and his days were often spent in bed. In the beginning of 1848, after four years of such disablement, he was induced to try a course of the hydropathic treatment, then coming into notice, and obtained a degree of benefit not amounting to a radical cure, but changing entirely his whole course of life. His headaches became rare; he was no longer obliged to be in bed in the day-time; he took regular exercise, and was fit for consecutive study. In 1849 he married, and in the same year resumed his residence in Aberdeen. He had hopes of being able to teach his class again, but found that his strength, though improved, was not equal to unbroken task work; and he made himself useful to the College in the struggles that ended in the union

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of the Aberdeen Universities in 1860, which led to his being superannuated.

In the agitation connected with medical education he always took a leading part. He was the chief promoter of the scheme of examinations pursued at Marischal College, which was a great advance in strictness and severity. He was deputed by the Senatus to watch over the medical Bills introduced in 1843 and 1844, and spent a long time in London for that purpose. His correspondence and memoranda are all preserved; and it is curious to see how completely he foreshadowed the scheme that seems at last destined to be carried for a common Examining Board. He was most zealous for preserving the interests of his College against the attempts of the more powerful Universities to leave it out in the cold. At the same time, he was very jealous of any departure from the strictness of its improved examinations, by which its reputation was gradually becoming rescued from no small degree of public contumely. One of his most energetic compositions was a protest against a resolution of the Medical Committee of Marischal College in favour of re-imposing fees for the Medical Examinations. As a specimen of his vituperative eloquence of style, I give the peroration, which was long remembered:—

"No measure by the University was ever received with more general approbation by the public in Aberdeen and in the north of Scotland than the abolition of fees for medical examinations. I do most solemnly protest against fees, *consequent on passing examination*, being renewed on any pretence, and under any form. Such fees brought us into disgrace before, and I am satisfied, with whatever slowness and stealthiness of pace, they will bring us into disgrace again. Having got rid of the abomination, let us not again touch the unholy thing. Bent as we may be on avoiding what is reprehensible, and feeling as we may that our motives are not wrong, yet we may be assured that on the first appearing of a hankering after the flesh-pots of our Egypt, an outcry will be raised not at all favourable to the interests of this University, partly by a few active and unscrupulous opponents of the University, but much more from sincere friends of the Universities as public institutions, who, jealous of their prosperity, will be unable to understand the reasons of our apparent backsliding; and, explain our conduct as we may, we shall feel ourselves unable to repress the prevailing outcry—the dog has

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returned to his vomit, the sow that was washed to wallowing in the mire."

The illness that in 1844 removed him from his laboratory, and made him an invalid, did not lay to rest the studious activity of his brain. The first subject chosen by him was the question of the transition from Anglo-Saxon to English, which, until lately, was slurred over in the loosest manner, it being assumed and affirmed by Hallam and others that, in much less than a century, the English people passed from speaking the Anglo-Saxon of the Chronicles to the early English of the thirteenth century. Dr. Clark's notions of possibility were outraged by this assumption, and he proceeded to examine all the authors of the transition time, and arrived at the conclusion that our modern English was a dialect co-existing with the Anglo-Saxon, instead of being derived from it. He never published any of the results of this inquiry; but his conclusions are now, after extended research, the received opinion on the question.

He was led off from this subject to the reform of our English spelling. He experimented, in his usual thorough-going style, upon various forms of a phonetic alphabet, and, after a succession of trials, suggested a scheme of vowel pronunciation, which, for simplicity and completeness, in my opinion, compares favourably with the numerous schemes now afloat. He also made experiments upon new forms of alphabetic characters, with a view to supply the deficiency in our consonants. He even went beyond this, and studied the means of reforming the whole of the existing characters, with a view to make them more distinct.

From early years he gave great attention to English style, and made the idioms of the language a matter of special research. He investigated a number of authors of different ages, and made many interesting notes of their peculiarities. He made a careful inquiry as to the English relatives, and pointed out the characteristic effect of "that" as compared with "who" and "which," showing by decisive instances the benefit that would accrue by keeping up this distinction, as it had been generally observed in our older writers, and is still attended to in good conversation. He also showed privately many illustrations of the placing of adverbial words, as "not" and "only," on which the ordinary grammars were either silent or confused. He applied a severe criticism to all vagueness

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and indistinct reference in the pronouns generally; and especially censured the indiscriminate use of "it," and pointed out peculiarities in the pronoun never adverted to by any English grammarian or critic. He took pains to correct the phraseology of the students' written exercises, and often gave invaluable aid to authors, young and old. It was to be expected that his own compositions should afford traces of these studies. His style could not be characterised in a few words; it is strongly marked with his individuality; and good service would still be rendered to students by the collected publication of his scattered writings. Many a volume has been composed with far less care and thought than he bestowed upon a pamphlet.

In 1848 he turned his attention to the question of the historical origin of the Gospels. He set to work with his accustomed precision, and prepared a series of comparisons of the Gospels, by pasting in columns, side by side, the parallel passages, making four sets of comparisons, one in the order of each Gospel. A minute study of these parallelisms suggested to him certain conclusions as to the verbal dependance of the Gospels on each other. But a question as to verbal agreement or discrepancy must ultimately be referred to the Greek original, and he felt, or fancied he felt, the necessity of qualifying himself to examine it from this point of view. Here, however, he met another source of uncertainty, namely, the recent introduction of numerous and various readings into the Greek text. He accordingly entered into this question likewise, and was ultimately and for many years absorbed in its determination. No such elaborateness of inquiry was ever shown in any learned research. He flattered himself that he had made the determination of nine out of every ten of the various readings a matter of certainty, and he had a peculiar pleasure in announcing, as the result of the whole inquiry, that the *Textus Receptus* was nearer the true text than any of the editions of the later critics. He was far advanced with his tabulation of the readings of the first three Gospels, and it was his wish that, if his life were cut short before completing the work, that what he had done should be edited and published under the superintendence of Dr. Donaldson, of the High School of Edinburgh. The MS. was, after his death, entrusted to Dr. Donaldson with this view, and was rendered almost ready for publication, when Mrs. Clark, acting under the advice of her own family, and chiefly of her brother,

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the late Dr. Alexander M'Ewen, of the United Presbyterian Church, Glasgow, resolved to proceed no further with the publication; and accordingly, the work has never seen the light. This result is one greatly to be deplored; and Mrs. Clark's family should reflect on the grave responsibility that they incur in suppressing a research that occupied more than ten years of Dr. Clark's life. His assistant in the final tabulation of the text of the three Gospels is now Professor of Biblical Criticism in Glasgow, and his students probably derive some of the benefits of Clark's researches.

His earliest publication connected with university reform was a pamphlet (in 1833) entitled "Reform in the University of Glasgow," containing a complete university constitution, with a new governing body, somewhat akin to the recently constituted university courts in the Scotch universities. There is also a minute examination of Mr. Oswald's Bill for the University of Glasgow.

The question of the union of the Aberdeen universities had been agitated at various times, and was brought up, soon after Dr Clark's appointment, by Mr. Bannerman's Bill, and again by the Royal Commission of 1836. Dr. Clark studied the whole subject carefully, and his letter to the Commission is a very able document, which can be looked back to with interest.

A pamphlet appeared in January, 1850, challenging the right of Marischal College to grant degrees in divinity, law, or medicine; and the official circular of King's College, for 1851, contained a sentence implying the same want of authority on the part of Marischal College. The terms were these:—"The University and King's College is the only institution in Aberdeen which has a legal power of granting degrees in medicine. All medical diplomas purporting to be from the University of Aberdeen, and not signed by the Principal and Professors of King's College, are illegal and void." This was the occasion of a pamphlet by Dr. Clark, in which he argued the question from a decision of the House of Lords, under Lord Chancellor Hardwicke, in 1745. His reasoning was forcible and conclusive, and was couched in his peculiar style of elaborate and studied statement. Both language and typography had their powers tasked to the utmost to give explicitness and force to the arguments. The title page ran thus:—"The right of Marischal College and University, Aberdeen, to confer degrees, not only in arts, as admitted, but in divinity, laws, and medicine, vindicated

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against the attacks of the responsible administrators of King's College and University, Old Aberdeen, and shewn to have been affirmed, more than a hundred years ago, by the House of Lords, as the Supreme Court of Appeal, under the instructions of Lord Chancellor Hardwicke. By one of the Professors."

The introduction of the Scotch Universities' Bill of Lord Advocate Inglis necessarily involved discussions and negotiations in the several universities. The Bill contained clauses for uniting the two separate Aberdeen universities—King's College and Marischal College—into one university. Clark took part in opposing the union, and was the author of numerous memorials and statements with reference to it. His opposition turned upon the very strong views entertained by him as to the effective teaching of the classes. It was the distinction of the Aberdeen Colleges to possess classes of manageable dimensions, with thorough examination and discipline, and he was strongly apprehensive that this advantage must cease with the fusion.

When Mr. John Stuart Mill became Lord Rector of the University of St. Andrews, he chose for assessor Dr. Clark, being intimately and personally acquainted with his general ability, as well as his great aptitude and experience in university matters.

Clark was, throughout life, an ardent politician of the liberal school, and formed decided opinions on all passing public measures. He was a frequent contributor of leading articles to the journals, and on those occasions wrote with rapidity, and with no small pungency of manner, as well as pertinency in the matter. He studied the question of the Corn Laws, and wrote largely upon it before the final settlement by Sir Robert Peel. In all the various controversies that he found himself involved in, he made free use of the editorial pen in support of his side.

A much more extended notice would be necessary to give an adequate impression of Clark's various labours and many-sidedness. His industry between the ages of twenty and forty must have been enormous. Could he have enjoyed other twenty years of good health, it is impossible to say what he might not have achieved in the science of chemistry, or in the advancement of the arts founded on chemistry. Graham used to say that "Clark narrowly escaped

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being a great man." He had the requisite force of faculty, and needed only a stroke of good luck in the direction given to his powers. His intellectual faculties belonged to the highest class. His strongest feature may be expressed by sagacity, and his delight was to attain his ends by the simplest, and often the seemingly most unlikely means. He had essentially a practical mind; his originality and his sagacity took the direction of practical suggestions. His love of minute accuracy, so valuable in itself, was carried to a pitch of extravagance, which was perhaps his chief foible as an investigator. He never knew when to have done refining and improving: hence the unfinished state of so many of his inquiries. His attention to style was an additional source of embarrassment and delay when he had any work to publish.

The impression that he left in Aberdeen was very great; but had he been able to teach a whole generation, instead of being superseded at the end of seven years, he would have been, in point of influence, second to no man that ever occupied a scientific chair.

The energy and vehemence of all his determinations made him urgent and imperious; and, while increasing his sway over others, often excited no small hostility and dislike. He was furious in his onslaught when roused by opposition, yet he could also control himself, and employ all the resources of his cultivated expression in suavity, courtesy, and conciliation. His loves and his hates were alike on a large scale, but his amiable side greatly preponderated. His generosity and sympathy were manifested both in public spirit and in private benefits. He was looked up to and beloved by the whole circle of his intimate friends.

He died on the 27th November, 1867.

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December 7, 1880.—Sheriff JOHN COMRIE THOMSON, *President, in the Chair.*

ALEXANDER BAIN, M.A., LL.D., Professor of Logic in the University of Aberdeen, read a "Biographical Memoir of Dr. John Shier."

DR. JOHN SHIER was born in James Street, Aberdeen, on the 1st July, 1807. His father, David Shier, at that time manager of the Leith and Clyde Shipping Company, was a man of shrewd, genial, and sterling character, exemplifying the best type of Scotchman. He had six children, John being the eldest, and strove to give them the benefit of a good education; an advantage that every one of them turned to good account. When John was nearly 14 years old, in 1820, the family removed to Banff, where the father long held an office under the Sheriff of the county. For Dr. Shier's early life and biography down to the period when I made his personal acquaintance, I give the following notes of recollections furnished by his brother, Dr. David Shier:—

"My earliest recollection of my brother, he being my senior by eight years, is that of a big lad in a blue coat with brass buttons. The coat was rather short in the tails, resembling the coats worn by the boys of Gordon's Hospital fifty years ago. His face had a pleasant expression, although the central incisor teeth in the upper jaw were at that period of his life rather prominent. The first school which he attended was kept by a Miss Brown, a well-known trainer of early youth, and a strict disciplinarian, but whose acquirements must have been far from extensive or accurate. I remember in after life, at a dinner party, one of the gentlemen (Mr. Catto), claiming early association with my brother as having sat on the same bench in Miss Brown's school. A free use of the tawse, occasionally applied in a way now obsolete, was practised by this lady, but a large brown wig, with which she decorated offenders, was occasionally had recourse to with beneficial results. It was the terror of the girls. From Miss Brown's school my brother was placed under Mr. David Grant, who kept a school in Longacre. My brother

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often spoke of this teacher with much respect, and attributed his early appreciation of poetry to his influence. The next remove was to the Grammar School. Two of the teachers in this seminary at that time were Mr. Watt and Mr. Forbes. A son of Mr. Forbes was in the same class at College with my brother. He became the Rev. Mr. Forbes, of Woodside. It was under Mr. Forbes that my brother entered the first class. The boys attending the school in those days were of ruder manners than now, and fights were of frequent occurrence; their language was also coarse and often-gross. My mother had great misgivings about the treatment he was likely to receive from the older boys, and on several occasions the lad returned home with the marks of rough usage on his face and clothes; but by and by his complaints became fewer, and he had learnt to take care of himself. My mother's impression that he was not so quick as some boys in learning his lessons, I have no doubt, was correct so far as the acquisition of languages was concerned, for the same difficulty appeared in acquiring the French language. My father engaged a tutor to spend an hour or two with him every evening, and I have the impression that his progress was from this time more marked. How many years he attended the Grammar School I do not know, but I know that, when he left, his class-books were Virgil and Buchanan's Psalms. Being the eldest child my father made him much of a companion, always taking him with him in his morning and evening walks. He was thus taught to be an observer of all natural phenomena, and early showed a great desire *rerum cognoscere causas*. He was fond of asking questions so as to elicit reasons for things he could not explain. When visiting during the summer vacation some of his maternal relations, he must have practised his system of interrogation to an uncommon extent, for one of them said to our mother—'For askin' questions the laddie does ding.' He was fond of birds, and could tell much about their habits, knew where to look for their nests, and could tell from seeing a nest what bird had constructed it, and from an egg what bird had laid it. With the common or local names of plants he was familiar, and could point out the places where knapparts and arnuts were to be found. He was fond of fishing, and was quite at home whether fishing for *poddlies* on the Inches, or trout or pike in the various burns to which he had access in the vacation. He had a repugnance to fishing with bait, and was a great adept at mounting

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(busking was the term used) hooks for fly fishing. Many of his companions came to him to have their fish hooks mounted, or to learn the art. He had acquired it from an uncle.

"On the removal of the family to Banff, in the spring of the year 1820, my brother was sent to the Grammar School there (Banff Academy, as it was usually called), presided over by Rector Cruickshank, a Latin scholar of high local reputation, but at that time past his best. It was the Latin department only that my brother entered. The only circumstance which I recollect about him in connection with the Academy, occurred on his first day's attendance. It had been the practice in the Aberdeen Grammar School for the pupils to acquire the 'Rudiments' in Latin, so on his being asked why a certain verb was followed by an accusative and dative, he at once gave the rule of syntax, *Verba comporandi, dandi, declarandi, et aufferandi regunt dativum cum accusativo.* Silence ensued, when the old rector exclaimed, 'Na, na, laddie, we're nae sae far advanced here; ye'll jist say it in English.'

"His attendance at the Academy was but of short duration; for in the end of the year, when out one day giving my father's horse an airing, he was thrown from the animal and trodden on. Why this fact was not told at the time I cannot explain. Possibly, like some cases which I have seen, he was not aware that any serious injury had been sustained; certain it is that for several days no pain was felt, and he continued to attend school. He then began to complain of much pain in the right side, and a doctor (Joseph White) was called in, who, without hesitation, pronounced the malady disease of the liver, and treated it as such. Weeks of great pain followed. Three ribs on the right side had been fractured. Inflammation had set in, a very large abscess formed, which reached the surface in half a dozen different places. A great flow of purlent matter continued, hectic fever set in, and death seemed at hand. Another doctor (Watson) was called in, who soon found out the true nature of the case, and was the means of restoring him to health after several years of slow convalescence. Confined to the house for so long a time, his only pursuit was reading, and it is almost incredible the number of books which he not merely read, but which he mastered, and to this period of his life he often referred with satisfaction, as having afforded him an opportunity of making extensive literary acquisitions which under other circumstances he might never have possessed. In 1825 he had regained such a

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measure of health as to enable him to enter as a clerk in the office of the Sheriff-Clerk of the county. During the two years he served in this office, he resumed at home his Latin studies. In the end of 1826 he left the Sheriff-Clerk's office, and devoted his whole time to the study of Latin and Greek, aided by a tutor who spent two hours daily with him. His great aim was to proceed to College, and accordingly, in October, 1827, he proceeded to Aberdeen, and entered the first class in Marischal College. He worked steadily, and I have no doubt made fair progress, but he gained no prize at the end of the session. Some of his Greek and Latin translations were given in a poetical form, and elicited commendation. A Literary Society was formed in his class during the first year, and it existed to the end of the third session. Frequently holding the office of president, many essays and papers read were preserved by him, and I remember several years after deriving much amusement and instruction from a perusal of them. The vacation of 1828 he spent at Banff, studying Latin, Greek, and Mathematics, and devoting a few hours a-day to private tuition. In October, 1828, he joined the second class at College, where he found Mathematics and Natural History (such as it was) subjects more congenial to his taste than Latin and Greek. He and a student of the name of Murker occupied the same sitting-room. He worked diligently during the whole session, and his name appeared in the prize lists in Natural History and Mathematics. He also gained the prize medal for his year, offered at the end of the session by the Lord Rector, Joseph Hume, M.P. The vacation of 1829 he spent in going over the subjects of study of the winter. At this time he acquired Taylor's system of stenography, improved by Harding. This was no mere study, but a thorough acquisition and making his own. This system he practised all his life, and he was fully sensible of the benefit he derived from it.

"In October, 1829, my brother returned to College and resumed joint occupancy of apartments with his class fellow, Murker. Natural Philosophy, Mathematics, and Greek were the classes of the session. He was greatly interested in Dr. Knight's Lectures, which, by means of his mastery of shorthand, he took down almost *verbatim.* During the session he contracted an acquaintance with the doctor, which ripened into a life-long friendship. With Dr. Cruickshank also he became intimate, and from these men he afterwards received counsel and countenance which were of the greatest value to him. At the close of the session his name again appeared in the class prize

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lists (Natural Philosophy and Mathematics). In April of that year (1830) he became tutor in the family of Colonel Gordon, at that time residing at Inverlochy, in the highlands of Banffshire. He greatly enjoyed his summer residence there, charmed with the wild scenery of the district. During his stay at Inverlochy he commenced and diligently pursued the study of Botany in his leisure hours (having only two pupils, the elder about eight years of age). Having begun the study of Botany in the Highlands, Alpine plants had ever after a great charm for him. In October he returned to Aberdeen for his fourth session at college, and in April following, on completing the curriculum, he obtained the degree of M.A., having made a fair appearance at all the examinations. It was at the close of the session, and after consultation with his friends, that he finally resolved what profession he should follow, and it was to qualify himself for becoming a teacher of some department of science in a seminary or college. With that object in view he spent the next eighteen months in the study of Chemistry, Geology, and Natural History. In the study of Chemistry he showed great ingenuity in verifying elementary facts with apparatus of his own construction, and that of by no means a costly description. His excursions to various places in the North of Scotland were numerous, and he soon became familiar with the lithological treasures of Portsoy and the fish beds of Gamrie. In October, 1832, he proceeded to Edinburgh, and entered the class for Chemistry, taught by Dr. Hope. He also entered the class for Materia Medica, taught by Dr. Christison, who had been appointed to the chair a month or so previously. Besides these, he attended the Anatomical class (in the private school), taught by Dr. Knox. He entered on these studies with much earnestness of purpose, but at Christmas received a sudden check from an attack of cholera, which was then prevalent in Edinburgh. He always had the impression that it was in the dissecting-room he caught the contagion, all the bodies for dissection being of persons who had died of that disease. The attack, although severe, was of short duration, leaving him, however, liable to palpitation of the heart, which continued to affect him for a good many months. He worked very diligently throughout the session, never allowing more than five hours for sleep. In April, at the close of the winter session, he joined the practical class for Chemistry in the University, taught by Dr. Boswell Reid, and the class for Botany, taught by Dr. Graham. Dr. Reid was attracted by his earnestness and carefulness,

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and inquired what profession he intended to follow. On being told, he extended many privileges to him, and was unwearied in making explanations of such difficulties as he met with.

"At the conclusion of the summer session of 1833 in Edinburgh, my brother returned to Banff. His intention was now formed of settling in Aberdeen as a teacher of Chemistry and Botany, but on consulting his friends he was strongly advised to deliver courses of popular lectures on these branches in the various towns in the North of Scotland, from which came the students resorting to Aberdeen, so as to extend his acquaintance with the leading men and acquire a name. With this object he gave a course of twelve lectures on Chemistry in Banff, in October and November of that year. In January and February of 1834, he repeated the course of lectures in Elgin, opening classes for Practical Chemistry. In March and April he repeated his lectures and classes in Forres. In all these places the attendance was good. In May he proceeded to Wick, with the intention of repeating his lectures there, but the gentlemen to whom he carried letters of introduction dissuaded him from making the attempt, on account of the depressed state of trade at that time. He went on to Kirkwall and gave his course of lectures, with practical classes, there in June and July. After finishing his lectures, he spent two months in studying the natural history of the islands. In December, 1834, and January, 1835, he delivered his course of lectures, with practical classes, in Peterhead. The lectures were well attended, and so many joined the classes that, to meet the demand for tuition, one of the classes assembled at seven o'clock in the morning. In February and March he visited Inverness, and gave his lectures there. In the summer of 1835 he gave a course of lectures on Botany in Elgin, which was numerously attended. Having formed the acquaintance of many scientific and influential gentlemen in the North of Scotland, he now resolved to make a commencement in Aberdeen. Accordingly, he opened his class at the beginning of the session 1835-36, giving lectures only. The course consisted of 120 lectures, and his class was attended by about 20 medical students and some young men of different pursuits. Five lectures were given weekly, and in the preparation of these, with suitable illustrations, his whole time was fully occupied. It was thought by his friends at the end of the session that he had made a fair start.

"In the summer of 1836 he opened classes for Botany in Peterhead. In the session of 1836-37 he repeated his course of lectures

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on Chemistry, with junior and senior practical classes, in a hall in Union Street. The number of students attending the lectures was considerably greater than in the preceding session, and the practical classes were well attended.

"In the summer of 1837 he gave a course of lectures on Botany in Banff, and in the autumn he gave a short course of Chemistry, in Montrose, I believe. In the session of 1837-38 his classes were still better attended, not only by students of medicine, but by students attending the Arts classes in King's and Marischal Colleges. In the summer he made an extensive geological tour in the northern counties, accompanied by Captain Jack (son of Principal Jack).

"The session of 1838-39 (his Chemical classes were taught in a hall in the Gallowgate belonging to Mr. Robert Dyce, advocate) proved a hard one for my brother. At the opening of the session, the health of Dr. Davidson, Professor of Natural and Civil History in Marischal College, became such as to unfit him for the performance of his duties, and my brother was asked by him to become his assistant. He did so, declining, however, to read the professor's lectures. The labour of this winter was very arduous, but the subjects he had to teach were familiar to him. Every minute was rigorously used in preparing his lectures, and drawings illustrative of them. During the whole session he did not retire to rest till one o'clock a.m., and at five o'clock a.m. he was again at work, the night watchman on the beat being employed, not merely to arouse him from sleep, but to keep knocking at his bedroom door till it was opened by him. His Chemical course of lectures and classes were carried on as in previous sessions. A fortnight in the end of the session was devoted to lectures on Civil History, but for this my brother was unprepared. Dr. Knight, who had at one time taught this class of the curriculum, offered him the use of his lectures on Civil History, of which he gladly availed himself. During the succeeding summer he devoted considerable time to this subject, so that before the commencement of the next session he was well prepared for all his duties.

"In the session of 1839-40 he discontinued his Chemical classes, finding the work connected with the College class quite enough to occupy all his time. I think it was in the summer of 1840 that he conducted the Botanical class in connection with the University, which had for many years been taught by Dr. Knight, but who now retired from it.

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"Session 1840-41 was the last in which he taught the Natural History class in Marischal College. During part of this session he taught the Chemical classes in Marischal College while Dr. Clark was in London on business connected with the scheme for the purification of the London water."

In my early student days I knew Mr. Shier as a private chemical lecturer, in which capacity he was in time a sort of rival to Professor Clark. Clark's method of teaching, at least in his first years, did not commend itself to the mass of students, and Shier's manner was much more taking. It was, however, when appointed in the session of 1838-9 to teach the Natural History class, that he became a familiar figure in Marischal College. I had attended natural history the previous winter, the last year of Dr. Davidson's lecturing, and was therefore not a pupil under Shier. But I can remember hearing of the instantaneous reform that he introduced into the class, both in regard to discipline and to the topics taught. Dr. Davidson's course, as is well known, was utterly chaotic, and he himself was wholly devoid of the qualities that inspire either awe or respect. Shier, as authorised and required by an express minute of Senatus, provided a methodical natural history course, in mineralogy, zoology, and geology; all of which he expounded with perfect lucidity. His manner of conducting the class, during the three years that he continued as assistant, made a general impression in favour of his teaching capacity.

The introduction to the College staff gained him the intimacy of the professorial body, and with some of them he was on terms of very intimate friendship. He enjoyed, as but few people did, the acquaintance of Dr. Knight, who had a very strong distaste for Clark's chemical teaching, and secretly encouraged his rival. But as soon as this rivalry ceased, Clark too became very friendly with Shier, and did him many a good service afterwards. In 1840-1, the last year of his teaching the natural history, Clark had to be a fortnight in London, and appointed Shier to carry on his lectures. I was then a pupil in the Chemistry class, and had the opportunity of judging of his style of lecturing. I found him perfectly clear and easy to follow; but, to my mind, he went on a little too fast; I found it more difficult to take complete notes under him than under Clark himself. Probably the effect would have been different if he

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had given the entire course. At the end of this session the Natural History chair became vacant, and great efforts were made by the Marischal College professors to get Shier appointed, purely from the belief that he was admirably cast for a successful teacher. It would have been fortunate for him and good for the College if he had been made professor. His energies would have found a congenial field to work in; and I cannot doubt that he would have raised the reputation of the chair in every way. I hardly know of any other sphere so well suited to his aptitude, taken as a whole.

I am indebted to Dr. Hugh Mitchell of Craig for the following description of his lectures:—"I was a student in the class at Marischal College that passed so suddenly and so fortunately from 'the old doctor' to his young assistant. The change was like the passing from blackest night into brightest day, not only in respect of the order maintained in the class, but in regard also to the style of lecturing. Of course the change was not popular with the idlers, but to all of us who had any desire to learn it was most welcome. He had some difficulty in restoring—no, I should say, creating—order, but after a sharp exercise of discipline in one or two cases he succeeded, and there was no more difficulty all my time. He commenced his course with Mineralogy, showing us in his first lecture the bag and hammer with which he mineralized, and giving us hints not only as to work in the study, but in the field. He then went into the history of Mineralogy as an Inductive Science, connecting it with great names— Werner, Havy, Berzelius, Wollaston, &c. After that we had an account of the various systems of classification, and he adopted as the one he was to pursue—the system of Phillips. The unwearied toil with which he had to prepare his lectures made them somewhat monotonous, unless to the earnest, but he threw flashes of interest around some of the minerals by mentioning where they were to be found in our own district. I also see now that he was aware of all the progress the science was making—hinting that there were differences amongst the felspars, micas, &c. He next advanced to Geology, treating it in the same way. He was evidently acquainted with the geology of the North of Scotland, and, on one point at least, was far in advance of his day. He taught us that the reptiliferous sandstone of Morayshire belonged to the New Red. At the meeting of the British Association at Aberdeen in 1859, Murchison strongly asserted its belonging to the Old Red, and Ramsay confirmed the deliverance of his chief. Harkness afterwards went over the

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ground, and adopted the same view. But the discovery of other reptiles has proved the rocks to be Triassic (a division of the New Red), and the explanation must be that a break in the continuity of the strata is concealed by the drifts and gravels that so deeply cover up the rocks in the plain of Moray. The other parts of his course were treated in the same way; but I am afraid the work of that winter laid the seeds of future weakness. After the session was over I saw him occasionally, and used to take any mineral or natural object to him to receive the name. He lent us books newly published, such as Johnston's Zoophytes and Turton's Manual of the Mollusca, and was ready in every way to encourage us to observe. Along with Robert Hunter (now engaged at literary work in London), I formed a small collection of land and fresh water mollusca, and at our friend's request some years after, we surrendered it to the Professor in the Chair of Natural History, and I well remember the indignation Shier expressed when his two students were dismissed in a sentence along with the fishermen of Footdee. Afterwards I occasionally met with Mr. Shier, but the enthusiasm of earlier days was gone, and I was not surprised when I heard that he had left Aberdeen for the West Indies. I have often thought what might have been done for Natural Science in the North of Scotland if Shier had been professor."

It was in the summer of this year (1841) that I became acquainted with him personally. We became very close friends, and saw a great deal of each other. I soon discovered what manner of man he was in his more private hours. In many points he was greatly ahead of me; and especially in fondness for general literature. He took delight in introducing to me his pet authors, and had a really fine perception of literary effect. I was a little shocked at his indulging this taste by sitting up far into the night, and being correspondingly late in the morning; a weakness that he never seemed to have overcome. He was also given to indoor, sedentary habits, which must have interfered with his capability of work. The failure of his application for the Natural History chair left him without any public employment. It happened, however, that the Fordyce Lectureship in Agricultural Chemistry was set agoing in the year 1841, and he obtained the appointment, and, during 1841-2, gave his first course of lectures. This brought him forward in the capacity of an adviser in farming; but I do not know what profit accrued to him thereby.

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One source of emolument was eventually opened up in connection with the guano trade, then at its height. Every few weeks vessels laden with guano arrived in Aberdeen, and samples of each cargo were sent to him for analysis; and, on his certificate of the constituent proportions of each sort, the guano was advertised and sold. This occupation had not commenced when I first knew him in 1841, at which time he lodged in an upper floor in Broad Street. It was a year, if not two, later that he occupied a small house in Gallowgatehead, in which he had a room fitted up as a laboratory, and was kept in steady work upon analyses, chiefly of guano, but also of manures generally, as well as soils.

It was in the winter of 1841-2 that his public teaching was confined solely to the agriculture. In the session following, 1842-3, Dr. Clark's health gave way about the new year, and Shier conducted the class for the remainder of the session. As Clark continued to be out of health, Shier became his substitute for the next two sessions, both in teaching the class and in examining for the degrees in medicine; and sat on the medical committee, which consisted of the professors and lecturers in the Faculty of Medicine.

Some other events need to be noticed during the years 1842 to 1845, as paving the way for his final departure from Aberdeen. In the autumn of 1842, I was engaged in revising the MS. of Mill's Logic, with a view to improve the examples of the Inductive part. Shier assisted in this work by his chemical knowledge. Mill was very grateful to him, and, as a return, enriched his botanical herbarium with specimens collected in various continental tours.

In the same year, in the month of September, Liebig was entertained to a grand dinner in Glasgow, at which were assembled all the chemists of the country, and many of the most influential men in Glasgow. Clark wrote to Shier that he should embrace the opportunity of meeting Liebig and the others; and, on Shier's talking of obstacles and engagements, spoke in a still more imperative tone, which had the desired effect. This visit to Glasgow was the beginning of important connections.

In 1843, Dr. Hope, Professor of Chemistry in the University of Edinburgh, wished to resign his chair, which he had held for 40 years. There seemed a probability that he would be succeeded by Dr. Samuel Brown, a young man of extraordinary reputation in Edinburgh for brilliancy of genius, but believed by the leading chemists to be a kind of impostor. A letter from Graham to one of

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the Baillies of Edinburgh had the effect of postponing the election for a session: Dr. Hope to provide a substitute to teach the class. Clark wrote to him, naming Shier for the office. I quote a few extracts from the letter, as testimony to his repute in Aberdeen at the time:—

"This gentleman is Mr. Shier, at present Fordyce Lecturer on Agriculture in Marischal College, by appointment of the Magistrates and Professors conjointly. He formerly taught Chemistry as a private lecturer in Aberdeen, with success and reputation. He taught the Natural History class there for two or three years, when the late professor was unable from age to teach, and with such tact and success that most of the professors exerted themselves, although without success, to get him appointed. The class came into his hands after the commencement of the session, in a very disorderly state. He immediately restored order, and has all along maintained it in his classes. Last winter I took ill from continued over-work, and although never absent before, was confined to bed for two or three months. Accustomed to speak my lectures from notes, and without a carefully written-out course, such as you have, I accounted myself most happy to be able to procure Mr. Shier to teach for me, which he did with all the success I had good reason previously to expect of him.

"Mr. Shier has a good, unaffected delivery, is heard distinctly, and makes an agreeable impression. He is a prudent and sensible man. If it should occur to you that your assistant should deliver your written lectures, Mr. Shier would, I think, do as much justice to them as any chemical teacher that I know, and he is abundantly qualified to have all your experiments performed as you have arranged. He attended your course some twelve years ago. Mr. Shier has also taught practical classes, and I think he would, in this department, give great satisfaction to the pupils. He taught my practical class the latter part of last winter.

"Your colleague, Dr. Allen Thomson, who was formerly mine, knows of Mr. Shier, who taught in Marischal College at the same time. All my colleagues have a very high opinion of Mr. Shier, and I am quite sure that they would concur in expressing a no less favourable opinion of him than I have indicated."

It was probably on the occasion of the Liebig dinner at Glasgow, in 1842, that he engaged with Griffin the publisher to edit Sir Humphrey Davy's Agricultural Chemistry, with which he took very

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great pains. It occupied all his spare time for nearly two years, being published in August, 1844. The work of Davy was brought down to the knowledge of the time "by copious Notes, embracing the important new information that had resulted from the numerous researches of Liebig, Boussingault, and other chemists of eminence. The advertisement farther adds:—"Having had many opportunities of verifying practical points, the editor has been enabled to state the results of his own experience in elucidating the suggestions of theory." The work thus became for the time a standard of reference in Agricultural Chemistry, and made the author widely known. Within a year of its publication, in 1845, overtures were made to him, on the part of the colony of Demerara, to proceed thither as agricultural chemist to the colony, with a view to suggest improvements in the sugar cultivation. He accepted the post at a guaranteed salary of £1000 a-year, with an allowance for a laboratory and laboratory assistant. At the same time he received from the Senatus of Marischal College the degree of LL.D.

Before leaving he spent a week or two in London, making the acquaintance of people that were of use to him, and among others Mr. Chadwick and John Mill. He arrived in Demerara in the end of autumn.

I wrote to him on various occasions after he was settled in the colony, but had no answer for three years. It was in September, 1848, when I was attached to the London Sanitary Commission, that I received a letter from him in reply to some reports that I had sent him by Mr. Chadwick's request. At that time I had myself composed an official report on Land Drainage, which I submitted to him for revision, before presenting it to the London Commission of Sewers, for which it was intended. Shier, in acknowledging the various documents, gave some particulars of his occupation and progress up till then. He had prepared one paper on Thorough Drainage as a commencement of the work to be done, and was following this up with a second. He had made investigations into the growth of the sugar cane and sugar making, and was then enunciating his views in a course of lectures to the planters. He seemed at that time to have made most way in regard to the manufacturing operations for sugar and rum, and looked forward to effecting an improvement of 50 per cent. in quantity, and as much more in quality in the production of those articles. He had also been appointed a member of the sanitary committee for improving the

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condition of Georgetown. His labours had already been acknowledged by the Governor in writing to the Colonial Office at home. I had, in my letter, urged him to get through his task so as to come home and get employment as an agricultural engineer in England, for which there were abundant openings; to all which he heartily responded. He complained, however, of the debilitating effect of his eternal summer, while alive to the enjoyment of tropical splendour, and gratifying his natural history tastes by exploring the wealth of new vegetation around him.

His preliminary Report on the duties of an Agricultural Chemist was very comprehensive. It chalked out a field of labour quite enough for a lifetime. The more purely chemical researches comprised the analysis of the cane-ash, everything relating to the composition of the soils, to manures, to the sugar and rum manufactures. Under mixed researches he included drainage, trials of new machinery, selection of new species of plants for cultivation, promotion of cattle labour, which involved the growth of suitable food for cattle. Lastly, there was included the means of diffusing agricultural information among the planters.

Of this great programme he executed several very important items. He prepared two Reports on Thorough Drainage, containing not only an exposition of principles, but a detail of experiments. He gave in very early a Report on the Starch-producing Plants of the Colony; and, in 1850, he reported on the Clarification of Cane-juice, with Practical Directions for conducting the process.

In 1850, he and Mr. Gordon were deputed by the Governor of the Colony to make an extensive tour for the sake of procuring information that might be of value to the planters. The subjects were very various, including everything relating to sugar and cotton cultivation. Their first destination was the West India Islands, and, on the voyage to Trinidad, Shier caught fever, followed by ague, which very much shattered him. After visiting the principal West India Islands, the deputation went to the United States to enquire into the cotton cultivation of the Southern States, and thence came across to England. I saw Shier as soon as he came to London, and was shocked with his emaciated look. He was able to go about business, and gradually picked up a little strength. I had many conversations with him about his doings in the colony, and found that he had mixed himself up with all sorts of things, including the public questions of the colony as to the supply of labour, education, and

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others. In opposition to the prevailing opinion of the colony, he privately advocated free trade, and helped to bring round some influential colonists to his views. He was long on the School Board, and at the time of his death was a member of the Board of Health. He was always in the most friendly relations with the Governor, Sir Henry Barkly, and, I suppose, with the Executive generally.

He and Mr. Gordon visited Holland to see the systems of Drainage pursued there. They also went to Manchester to consult with the President of the Chamber of Commerce as to the qualities of cotton most in request among the manufacturers.

Shier drew up for the Governor an elaborate Report on the results obtained in the course of the tour.

In London, he was well received by Lord Grey, then Colonial Minister, and had conversations with him on the state of the colony. He spent several months at home in seeing people and in recruiting his health, but he was very far from recovering his previous condition. His return to the colony was not viewed hopefully by his friends, as far as I can remember, certainly not by me.

Before leaving Demerara, he had taken a piece of ground adjoining his house as an experimental farm, which he might have managed with profit to himself in the long run. He returned to the colony in the autumn of 1850, and resumed his duties with his enfeebled frame. His salary as Chemist had not been guaranteed for a series of years, but depended on an annual vote of the Legislative of the Colony. It was continued till 1853, but the vote of that year was accompanied with a resolution that it should not be renewed. The ostensible motive was that his services had not been of sufficient value to justify the expenditure; but it was well known that personal considerations were behind. The action of the Legislative was both ungrateful and short-sighted; but the colony was in a very unsettled and transition state; and Shier supported advanced and enlightened views on labour, education, free trade, and the franchise, while only a minority was in their favour. It is also to be remembered that many of the leading men in the Colony thought only of immediate results; and put little faith in scientific investigation as the basis of improved processes in the culture and manufacture of the staple products of the Colony.

Deprived of his office, he fell back upon his farm, and also set to work to arrange his voluminous notes for publication. While so

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engaged, his health finally broke down, and he took his passage for England to recruit and finish the arranging of his papers. By a sudden and brief attack he was cut off a few days before the sailing of the vessel, on the 28th of April, 1854.

The following extract from the chief newspaper of the Colony gives the impression that he left behind there. It is, I believe, from the pen of his friend, Mr. Gordon, who better than any one else was acquainted with his whole career in the Colony :—

"His career in this colony fell short, it is true, of expectations which, considering the subjects to which his labours had to be applied, were, perhaps, unreasonably sanguine; but we are borne out, nevertheless, by the testimony of many who know the subject well, that great benefits have accrued to the colony, both directly and indirectly, from his labours and instruction. The great improvements which have taken place since the year 1845 in the drainage and tillage of plantations and manufacture of sugar are, to a considerable extent, to be attributed to the suggestions and impetus given to improvement by the presence of Dr. Shier. His writings on Colonial Products, although brief, are now referred to and quoted as authoritative by writers on that subject in England. To those who knew him best, he was appreciated as a man of varied and extensive acquirements, literary as well as scientific; and few ever left him without having their knowledge improved by his conversation."

The defect of character that stood in the way of Shier's success in the world was weakness of will, of which the most conspicuous display was his habitual procrastination. He liked to do well and thoroughly whatever he undertook, and often spent more time over his work than was perhaps absolutely necessary. This itself was a source of delay in executing his projects. But he was too easily diverted from the work of the day, and too confident in what he could do on the morrow, so that time slipt away, and things undertaken were not done. The effects of this weakness would be aggravated in the debilitating climate of British Guiana. It needed a man of rare energy and resolution to take the measure of the situation there; to find out exactly what was practicable in the circumstances, and to resist all the temptations to quit his plain path. Shier had the requisite intellectual resources to qualify him for an adviser to the colony, and, as it was, he gave more than he got; but he sacrificed his own future career. We can only wish that his energy of will had been more equal to the position, and that after

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four or five years devoted to the task of improving the agriculture of the colony, he might have returned to Europe with his reputation increased, and able to devote the remainder of a long life to similar work at home.

Shier was an original member of the Philosophical Society, and one of its leading spirits for five years. At its fourth meeting, 3rd April, 1840, he read a paper on "The different species of cetacea found on the coast of Aberdeenshire." On the 8th January, 1841, he presented a "Catalogue of the Simple Minerals found in the vicinity of Aberdeen." On the 9th April he exhibited "a Drawing of the Sea Bream, as found in the Moray Firth, differing in some respects from the published figure." At the same meeting he gave a paper on the *Salmo trutta* and *Salmo albus* (white trout and finnock). At the election of office-bearers for the next session, he was chosen a vice-president. On the 2nd December, 1842, he read a notice of experiments with various manures made during last season. This was the second winter of his agricultural lectureship, and showed the direction given to his studies. On the 5th March, 1843, he exhibited a specimen of a peculiar fish—*Syngnathus Oqureus* (Lin.) cast ashore during a late storm. In the beginning of the following session he was elected President. On the 3rd January, 1845, he gave an account of his analyses of guano. This was his last contribution.

During his visit to this country in 1851, he contributed (on the 4th April) a paper on the "Cultivation of the Sugar Cane." A full abstract is given in the minutes.

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19th January, 1875.—Professor OGILVIE, *Vice-President, in the Chair.*

ALEXANDER BAIN, M.A., LL.D., Professor of Logic in the University of Aberdeen, read a "Biographical Memoir of Dr. Neil Arnott." First part.

8th November, 1881.—Professor STRUTHERS, *President, in the Chair.*

Second and concluding part.

DR. NEIL ARNOTT was born on the 15th May, 1788, at Arbroath. His father, Alexander Arnott, belonged to a respectable Scotch family of that name. One of his brothers, David, served as Major of Infantry in North America and the West Indies. Another, Charles, having made a fortune in India, acquired an estate in New Forest, Hampshire. A third, James, held the lease of two large farms separated by a river, in which he was drowned while fording it in a flood. He had married the sister of a distinguished Indian officer, Colonel Leith, Judge-Advocate of the Madras Army, who was owner of the estate called Leithfield, in Kincardineshire, which estate came by purchase into the hands of James Arnott's eldest son, a Writer to the Signet in Edinburgh. There was an only sister, also possessed of independent means.

Respecting Alexander Arnott, it is known that, like the other members of his family, he began life in good circumstances. He inherited the long lease of a valuable farm, which had been let to one of his ancestors at a time when the rental (paid in kind) was very small in proportion to what it was worth in his time. He was also engaged in trade, but seems to have made some bad ventures. While young, he became a Roman Catholic, owing, it has been supposed, to the influence of some French refugees, and, as usual with converts, he was a zealot for his creed. He was a well-informed man; knew Latin and French; and spoke and wrote well. He lived beyond his means, and fell into bad circumstances, so that the family had to struggle with difficulties.

Dr. Arnott's mother, Ann Maclean, was daughter of Maclean of Boreray, a small island to the north of North Uist. While the kelp

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trade lasted, he had three thousand a-year from kelp alone.* He traced his descent to a famous chieftain, "Niel Bane." The Macleans were connected by blood with the still more powerful clan Macdonald. Ann Maclean was a remote cousin of Flora Macdonald (of Charles Stuart renown), and remembered, when a girl at school, receiving a visit from Flora, her arm tied up in a sling. Flora lived in Skye.

The house of Maclean, for independence of bearing and for disinterested loyalty, held, for many centuries, a conspicuous place in the history of Scotland; but it had for ages to contend with the powerful house of Argyle. The Macleans uniformly espoused the cause of the Stuarts, down to the last rising in 1745, since which time many of their number have served under the reigning family.

Maclean was a Protestant, but his first wife, the mother of Ann, was a Catholic, and educated her daughter in the same faith. Her introduction to Alexander Arnott, and their marriage, was brought about by Bishop Hay, the celebrated Catholic writer. She must have been visiting in the neighbourhood of Arbroath and Montrose. At the time of the marriage she was eighteen. She was, in a high degree, energetic, intelligent, and amiable; while possessing also the accomplishments of a well-educated young woman of the time. She had a remarkable musical faculty, and, in her manners, bore the stamp of birth. The expression of her features, with many of her bodily and mental characteristics, seemed to be reproduced in her son Neil, although, in facial outline, he resembled his father.

Alexander Arnott's farm, in which he spent the first years of his married life, was Upper Dysart, in the parish of Maryton, Forfarshire; a good arable farm of four hundred acres, now rented at £640. The situation of the farm is unusually striking. It lies opposite the middle of the Bay of Lunan, near Montrose, a flat sandy bay about three miles long, flanked at the ends with rocky heights of two or three hundred feet. It is on ground raised considerably above the bay, and, being only three-quarters of a mile distant from the sea, commands a fine sea view, the sands being hidden, but the rocky extremities being prominent. The situation otherwise is remarkable. Standing with face seawards, on the left, about a mile off, we see the Castle of Duninald peering out of its lofty woods: and over these

* In 1820, Maclean came to London, a sufferer from stone, and put himself under the care of Dr. Arnott and Sir Astley Cooper. By their conjoined ingenuity, a successful operation was performed, which, as afterwards modified by Cooper, led to "lithotrity."

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woods are the spires of the town of Montrose, three miles distant. Turning round farther to the left, we light upon Montrose basin, a far reaching inlet of the sea, beyond which is the general appearance of the valley of Strathmore, with the gentle ascent towards the Lower Grampians. On the right, and behind these, is a bold and varied scene of hill and wood, stretching away towards Arbroath, at a distance of eight miles.

The house and steading occupied by Alexander Arnott is now giving place to a new erection. It belongs to a prevailing style of good farm houses in the last century: a long, narrow, two-storey building, with perhaps six or eight rooms, each room extending from front to back wall. There still stands on the farm, a field length from the house, a detached building, erected for a dove-cot. This building, entwined in Dr. Arnott's early recollections, was a regular institution of the district: each farmer, by his lease, was bound to feed a flock of pigeons for his landlord's use.

The Bay of Lunan was an easy walk for children seeking play: across a few fields, they could descend by a small wooded ravine, with a streamlet in the bottom, called the Buckie Glen, and thus reach the flat sands in the middle of the bay. There is also a considerable skirt of sandy hillocks, available for the roamings of youth.

It was in consequence of Mrs. Arnott going to Arbroath to be confined that Neil was not born in the family home. He was the second child; others following in rapid succession. At Upper Dysart he passed his childhood, and began his education, partly with his energetic mother, and partly at the nearest school, which would be Lunan Parish School, two miles off, in the direction of Arbroath. The school stands on a knoll in the valley of the river Lunan, entering the bay. Conspicuous on a promontory of the sea is an old ruin, the Red Castle. From his earliest years, Arnott was awakened to natural objects, and at Dysart he came under the attractions of the sea on the Lunan sands. He often referred back to this experience as his introduction to the great powers of the physical world. The tides, the tidal pools, the waves, impressed in him a precocious interest, but the direction that it took was not artistic, but scientific.

His father's misfortunes obliged him to sell the lease of his fine farm, and the next abode of the family was the neighbourhood of Aberdeen. In the Dee valley, four miles from that city, and on the southern slope, is the estate of Blairs, remarkable for its history.

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Far back in the middle ages, it and great part of the parish where it stands—Maryculter—became the property of the Knights Templars, by whom it was let out in miserable crofts of a few acres each. On the suppression of the Order, King Robert Bruce transferred the property to the Hospitallers, who held it till 1535, when it was given to the family named Menzies (most of whose members were Catholics), with whom it remained till the present century. From the representative of that family, in 1796, Alexander Arnott rented the Home Farm (so called because it was attached to the house occupied by the Menzies family—" mansion " is not the word). The extent of the farm was a hundred acres, and the rent £46 a-year, representing the value of land at that time.

This was, accordingly, the abode of young Neil Arnott at eight years of age, and here he remained between two and three years. The feature of the scene that most engaged him now was the rapid flowing Dee, which runs close by the outskirts of the farm. He commemorates his recollection of the salmon fishing, and was dexterous enough to catch trout himself. The scenery is grander than at Dysart, the highest Grampians being visible from the neighbourhood; but young Neil was not specially alive to scenic effects, except in the physical aspects of moving power. He attended the neighbouring parish school of Maryculter, and, besides the R's as there taught, he would commence Latin, receiving, probably, a good part of his instruction from his father. Notwithstanding the circumstances of the family, he enjoyed a seemingly endless flow of animal spirits; from after years he looked back to Blairs as a paradise. Crossing the river to the north, by a walk of two or three miles, through woods, he visited the House of Kingswells, a few miles from town, on the Skene Road, in which dwelt good " Auntie." There he first handled and discharged a gun, and brought down a bird instead of himself. He could cut from a turnip a water-wheel, and set it going in a stream, and was very expert at rigging and navigating ships. Once the entire household assembled to see him empty a tub of water into the well by a syphon.

The farm was given up in 1799, when Neil was eleven. The property of Blairs, in 1827, was bestowed in trust for the founding and maintaining of a Catholic seminary, and a large college building now stands by the site of the house where the Arnotts lived; their farm is kept as the college farm.

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From the rent rolls of Blairs, it appears that the farm was nominally given up in 1799. The Arnotts, however, removed to Aberdeen in the previous autumn. Neil was now in his eleventh year. The mother entered into business, on her own account, as a stay and corset maker, her daughters working along with her; and, principally by her activity, and by the assistance of their wealthy relations, was the family brought up and educated.

Young Neil and his next younger brother, Alexander, entered the Aberdeen Grammar School, in November, 1798, and he continued there three years. The school is an old foundation, in charge of the Town Council, who provided the building. While a Principal of Marischal College, in the seventeenth century, Dr. Patrick Dun bequeathed a considerable endowment for the Rector and three Masters. The aim of the school was to prepare boys for entering Marischal College; and the preparation consisted exclusively in learning Latin, and more especially Latin Composition, upon which was to be gained one of the competitive bursaries at the College. The full time usually spent at the school was five years: three years under one of the three Masters, and two years under the Rector. Each Junior Master went through all the three years with the same class, so that there was no change of teacher until the fourth year, the first of the two Rector's years.

Arnott's master was named Duncan, an able man and a good teacher. He was a friend of Arnott's father. In spite of the harsh discipline of those times, he gained something like affection from his pupils, and Arnott's class subscribed to make him a present, in the shape of a book of his own choosing. A son of his, after serving with distinction as a surgeon in the military service of the East India Company, died in Jersey. His executor was Dr. James Arnott, who discovered among his effects the book that had been presented to his father. The inscription was in the handwriting of Neil Arnott.

The quarterly class lists of the school are preserved, and as they give the order of merit at the time each was made up, we can trace the career of the pupils in the matter of proficiency. In the first list (January, 1799) Neil Arnott is tenth, Alexander second; three months later, Neil third, Alexander ninth. On the 12th June, 1800, Neil is second, his brother disappearing. The four entries of Neil's third year (his last) are fifth, fourth, thirteenth, second (August, 1801). Alexander, who was so promising at that time,

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was diverted into another career, and ultimately got a commission in the army, being put upon half-pay at the peace. Notwithstanding good ability he spent a fruitless life.*

The pupil that kept Neil out of the first place was Alexander Black, who became Professor of Theology in Marischal College, and thence passed in 1843 to the Theological Hall of the Free Church in Edinburgh. The lists show him to have been almost always at the top. His talent for languages was very remarkable. As a Theological Professor he could extemporise Latin with ease. It happened, however, that at the end of the third year, Arnott got the first prize. Dr. Arnott and Black had very friendly relations all through life.

Instead of remaining to the Rector's classes and completing the five years' course, Arnott went into the Bursary Competition at Marischal College at the beginning of the session 1801. He was now thirteen, which was older than the average of boys at the same stage in the school, being in fact about the age usual for quitting school from the fifth class. The bursaries were, of course, as a rule, gained by the fifth-year scholars. There were thirteen bursaries in the competition of October, 1801: two at £10 a-year, one at £8 10s., two at £6, seven at £5, one at £2 15s. 6d. The competitors were not exclusively from the Grammar School; but among those that succeeded were seven from that school, four being fifth-class boys, two fourth-class, and one from the third—this was Neil Arnott, who came in sixth, his bursary being £5. If Alexander Black had gone

* Lord Byron, being a pupil of the Grammar School about this time, has been the means of giving it notoriety, if not reputation. Byron left a little time before Arnott joined. From his own account, we learn that he was at the school nearly four years, and left Aberdeen for England in summer, 1798. The last entry of his name, in the fourth class catalogue, is under date the 18th June, 1798; he stands seventeenth in the class, about the middle. Moore, in a footnote referring to the position of Byron in the lists, quotes only two dates, April, 1794, when he stood twenty-third, and April, 1798, when he was fifth, and gives the difference as a criterion of his progress. This is a mistake; and the best corrective is to give the full series of entries. The first of Moore's two dates. April, 1794, is probably wrong, as it would imply that Byron had been two years in the first class. Unfortunately, the lists are now wanting for that and the following year, but the entries can be given for three years. In 1796 he was in the second class; and the quarterly entries are these:—January, twenty-third in order, number of class, 38; April, sixteenth in 32; June, sixth in 33; October, twenty-second in 32. For 1797:—Thirteenth in 33; eighteenth in 34; twenty-first in 35; twenty-second in 34. For 1798:—Twenty-second in 30; fifth in 29; seventeenth in 28. Moore mentions the fact that at stated times the master inverted the order of the class, so that the bottom boys were at the top, from which they gradually fell in the struggle of the lessons; this would be sufficient to explain Byron's two exceptionally high positions, while the remaining nine show that he made no upward progress during his school career. As far as concerned Latin study at that time, his attainments and his application must have been mediocre.

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in, he also must have been among the successful candidates, but he remained at the school the full time, and two years later gained the first bursary, doubtless with ease.

Arnott was now entered a student of Marischal College, where he went through the accustomed course of four sessions, each occupying the five months from November to April. The fees at that time were smaller than now, the highest in any class being two guineas for the winter session, and the classes being few. In each year there was one principal class, meeting three hours a-day; in the second and third years an additional class for Mathematics met one hour a-day, for which the fee was one guinea. To cheapen the course still farther, bursars holding bursaries under ten pounds (most of the competition bursaries were below that figure) paid reduced fees on an *ad valorem* scale: a £5 bursar paid only half fees. Hence of these small annuities there remained, after paying fees, with certain other dues (fires, &c.), and a special charge in the fourth year for graduation, a sum to be paid over to the holder of the bursary. Thus, in Arnott's case, the balance received by him in the first year was £3 6s.; second year, £2 13s. 6d.; third year, £2 12s. 6d.; fourth year (graduation), 10s.

In his first session at Marischal College, Arnott sat, three hours a-day, in a class of 35, under the Professor of Greek, there being no other teaching that session. The Professor, John Stuart by name, was a man of ability and scholarship, with a caustic tongue, but not aspiring to a literary reputation. He was proprietor of the estate of Inchbreck, in the parish of Glenbervie, and came into contact with James Mill as a boy, whom he befriended. A writer of the present day, Mr. Stuart Glennie, is his grandson. We may presume that young Neil Arnott would not neglect the work of the Greek class, his only occupation for the winter. As the pupils knew no Greek on entering, they commenced with the alphabet, and had to go through the grammar. They then did easy reading, and by the end of the session got through some portions of the simple prose writers, and a book of Homer. In after life, Dr. Arnott showed very little trace of his Greek studies.

The principal class of the second year, taught also three hours a-day, bore the designation—Civil and Natural History. The Professor's name was James Beattie; he was nephew and namesake of the poet. His lectures seemed to have left a favourable impression upon his pupils; and, having a fiery temper, his discipline

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was excellent. For about four months, he gave an hour a-day to the Civil History department. The course professed to be Universal History, but must have been limited by want of time; the ancient nations probably receiving the preference. The Natural History department was miscellaneous—Chemistry, Botany, and Zoology—a little of each. A pupil, who attended him four years later, remembers the Professor explaining the Acids and Alkalies, and also his dissecting a dog. Moreover, for two or three hours a-week, Latin was read, being a small provision for carrying on the pupils in that language. There was nothing done for Greek. It may be fairly surmised that Arnott would be a working student in all these subjects, but we have no record of his own impressions of the class.

In this session there was a mathematical class taught one hour a-day, which undertook Algebra (up to Equations), the Six Books of Euclid, and Plane Trigonometry. The Professor of Mathematics, Robert Hamilton, was the only one of the staff that had gained renown beyond the University. He was an able mathematician, author of a standard book on Merchandise (having been once in business himself), and got fame as a political economist for his work on the National Debt. Nevertheless, this was the only class in the College that could be pronounced a failure. Owing to an insignificant presence, and an utter want of energy and self-assertion, Hamilton gave up the reins to the pupils; and the class was perpetually a scene of turmoil and confusion. Only by a few zealous students could any scraps of Mathematics be picked up under such a teacher. We know that young Arnott did apply himself zealously to Mathematics, being ambitious to gain the only prize of any value in the University, a mathematical bursary (worth £25).

The third year of the curriculum had, for its principal class, Natural Philosophy, taught three hours a-day. Another hour a-day was devoted to a higher mathematical class. It was here that Neil Arnott was thoroughly at home, and his good fortune was remarkable. The Professor was Patrick Copland. His course of Natural Philosophy was something entirely new in the annals of University teaching, and left a deep impress on the minds of a whole generation of students. He constructed, partly with his own hands, a complete apparatus for the experimental illustration of every branch of the subject as then taught. His lecturing was lucid and telling, both from his experiments and from his command of familiar examples. The class always contained, in addition to the regular or curricular

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students—called *gown* students, from wearing red frieze gowns—a number of *privates*, who came to this class alone, or perhaps took it with one other. Among these was Francis Hare (brother to Julius and Augustus Hare). On the experiment of the figures made to dance up and down in a jar of water by the pressure of the hand on a membrane at the mouth of the jar, Arnott and Hare had an encounter before the Professor, and Hare was floored. Another private of the class was Patrick Calder, of Inverness, whom we shall hear of again.

Dr. Arnott repeatedly avowed his obligations to the instruction and stimulus of Copland's course. He carried away full notes of the lectures, and turned them to account in his after studies. He has reproduced a good many of Copland's illustrations, but his own matured conception of the handling of Natural Philosophy was not borrowed from any one.

The sole class of the fourth year was Logic and Moral Philosophy, also taught three hours a-day. It included readings of the classics. The Professor, George Glennie, had recently succeeded Dr. Beattie, the poet, having been assistant to Beattie during his last years of failing health. While assistant, Mr. Glennie would naturally read Beattie's lectures. On being appointed to the Chair, he was his own master, but, through marriage with Beattie's niece, he inherited the lectures, as well as the library and other effects of the poet Professor, and might be expected to avail himself of these lectures till he had time to prepare an independent course. We may reasonably judge from Beattie's Elements of Moral Science, the probable subjects of Professor Glennie's lectures in 1804. Beattie, elegant and tasteful as a writer, had little originality in thought, and drew his material from Reid and the other writers of the Scotch School. His course of Moral Science comprised, first, Psychology, divided, after Reid, into the Perceptive Faculties (Intellectual Powers) and Active Powers; Natural Theology; Moral Philosophy, including Ethics, Economics (Family Relations, Master and Servant, Slavery), Politics (Forms of Government), and Logic (in fact, Rhetoric, with a few remarks on the kinds of Evidence). Arnott was here also a very diligent student. It was probably in this class that he first contracted his interest in mental science, which never left him. In his comprehensive sketches of Knowledge, he always gave a place to the Mind, and exemplified some of its leading doctrines; and although he had little time to

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read works on the science, he held peculiar views upon it formed from his own reflections. The portion of the course that he used to revert to in conversation in later years was a pretty long series of lectures on Language, being the Philosophy of Universal Grammar, together with Rhetoric, in both which Professor Glennie's master was especially at home.

He obtained his M.A. degree in April, 1805. This proved nothing but attendance for four years in the set classes. The examination was a venerable form, and meant nothing.

The curriculum of Marischal College would not provide full occupation to a mind of any activity. Besides, there were vacation intervals of seven months, and nothing to prepare for the work of the winter. Unfortunately, however, Arnott had not his time at his own command. He served as shop assistant to a chemist and druggist named Ironside, for how long we cannot tell. Although his master gave him leave to attend the classes, his studious hours must have been considerably restricted. But for this, he might have turned to much more account the Marischal College teaching, such as it was.

In following out the bent of his mind to medicine as a profession, his difficulties were of no ordinary sort. There was a small compensation for the drudgery of a shop in his becoming acquainted with pharmacy. This was all that the situation admitted; for his master was not one of the high-class apothecaries that could give medical advice. In those days, Aberdeen did not contain the requisites of a proper medical education. Young men, possessed of means, studied in Edinburgh, or in London, or partly in both. An inferior mode was to become apprentice to a medical man in town. Sometimes one practitioner had several apprentices, and directed their book studies, as well as introducing them to cases; but, in many instances, the pupil gained from the connection little beyond the certificate. In the Infirmary, also, there was an opportunity for clinical instruction, but with little formal teaching. The certificate of apprenticeship, and the attendance in the Infirmary, counted for part of the qualification to pass at the College of Surgeons.

Arnott had not the benefit of being apprenticed to a regular practitioner, and was, therefore, in an unusual degree, self-taught. It was possible for him to go forward on a certificate from some medical man that might be induced to take an interest in him, and testify to his medical knowledge. He must have attended the

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Infirmary. However obtained, he carried his qualifications up to the point that, by the help of one year at a London hospital, would enable him to present himself as a candidate for the diploma of the Royal College of Surgeons.

The provision for dissecting the human body was peculiar. The medical students formed themselves into a society for studying Anatomy. This they carried on in an out-building, allowed for the purpose, in Marischal College. There was at that time no Professor or Lecturer on Anatomy. For a century or more there had existed a Professorship of Medicine, duly filled up; but, standing alone, this Professor could not form a medical school, and so he did not teach a class. What he seems to have done was to superintend the dissecting-house, either by himself or by some deputy, giving the students directions how to dissect; while all the apprentices, for the time being, came together in Marischal College to witness and perform dissections.

It was the same society of students that had to find the dead bodies. Occasionally bodies could be purchased, and the worst class of capitally-condemned criminals had their bodies assigned for dissection, but the regular supply was by means of resurrection. In Aberdeen, as elsewhere, before the passing of the Anatomy Act, the students themselves, with hired assistants, had to go through this unseemly work. Some insight into the operations of the Aberdeen Society, in Arnott's time, is furnished by the accidental preservation of the Society's account book for the year 1806, his last year in Aberdeen. His name regularly appears in the subscription lists, and for three months, from June to September, he was treasurer, the entries being all in his clear, delicate hand, which would have made the fortune of a writing master. There was an admission payment of one guinea, a monthly collection of one shilling and sixpence, and a rigorous system of fines; for absence from a meeting, sixpence; for being late, threepence. The disbursements are, for the most part, in discharge of certain accounts referred to only as No. 1, No. 2, &c. But it can be seen from occasional entries what these accounts must have referred to. A salary of a guinea yearly, and one shilling and sixpence on every new member, were assigned to "George Pirie," the College servant, who kept the dissecting room. There are such entries as—"Resurrection expenses, No. 4, ten shillings and sixpence"; "Extra do., No. 4½, three shillings"; "Mr. Bowers, the secretary, to purchase some board for *a certain*

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purpose (under-scored in the book), two shillings and sixpence"; "Mr. Fife (not a member, probably the resurrection assistant), for himself, a guinea"; "Do. to give away to the wife's husband who was *resurrected*, a guinea." There are a number of small payments of a few shillings; but a guinea is a frequent payment, and was probably the usual fee to the man employed in each case.

It is known that Arnott worked very hard at his medical studies in Aberdeen. His intention was to go for one winter to one of the London hospital schools, to obtain a diploma (doubtless the College of Surgeons), and to return and begin practice in a Scotch town, perhaps Aberdeen. Accordingly, within a few days of resigning the treasurership of the Society, he left Aberdeen for London, and, after a voyage of six days, arrived there on the 29th September, 1806. He attended the classes in St. George's Hospital, and was the pupil of Sir Everard Home. Sir Everard was then introducing a new mode of treating stricture, and he found Arnott a very apt pupil. So strong was his conviction on this head, that, on being applied to by a patient subject to stricture—the captain of an East Indiaman—to recommend a surgeon that could treat the ailment by his own method, Home suggested young Arnott. It was of course necessary that he should be found qualified, and it was the College of Surgeons that the Company looked to for testing the candidates. Arnott had no difficulty so far as that went. But it was a rule of the Company that their medical officers should serve one voyage as assistant surgeon before being appointed full surgeon. Through the influence of the captain and Sir Everard (who was one of the examiners at Surgeons' Hall), this rule was relaxed, and Arnott became full surgeon to the "Surat Castle," one of the largest ships, bound for China direct. The captain, at whose instance he was promoted, was Alexander Robertson. Of the other officers, the purser, Lachlan Mackintosh, was the one most associated with his studies and pursuits on board. His old class fellow, in Copland's class, Patrick Calder, was a passenger. The ship sailed from Portsmouth on the 18th April, 1807, a month before he completed his nineteenth year. There were troops on board, who, as well as the ship's crew, came under his charge. It is said that the officer in charge of the troops was displeased with the youthful appearance of the surgeon of the ship, and wrote to his superiors to say that the men were to be under the medical care of "a boy."

He carried to sea with him all his scientific notes, besides books

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on other subjects, including the "Wealth of Nations." He not only engaged in study on his own account, but stimulated others to go along with him, and became the mentor of the ship. With Calder he began Italian. On one occasion a foreign ship hove to, and a Frenchman of rank came on board. Neither captain nor officers being able to converse with him, Arnott's Aberdeen French was found equal to the occasion. He expanded his scientific notes, and gave lectures, with experiments, in Natural Philosophy and Chemistry. He also undertook a course in Political Economy. He found the captain the aptest pupil, and took some credit for preparing him, at an after period of his life, to sit in Parliament. It was a natural consequence of his studies that he was an adept at lunars, and here too he was of use to the captain. One of the incidents that he was accustomed to tell was, his relieving the captain from the depths of distress, when, on one occasion, from the distraction of a gale, the chronometers had been forgotten, and ran down. The captain, on winding them, found, to his horror, that they did not go. At first he concealed the disaster, but his woe-begone face attracted attention, and caused general uneasiness. Arnott was put forward to ascertain from him the secret cause of his uneasiness. He soon relieved the captain's distress by shaking the chronometers till the balance wheels got into swing.*

The ship had got only as far as the Bay of Biscay, when a leak was discovered, and she was adjudged unfit for rounding the Cape. The resolution taken was to cross the Atlantic, and put in at Rio Janeiro for repair. On the way to Rio, Teneriffe was passed, the first land encountered on the voyage. Being several weeks at Rio, in July and August, Arnott, in company with Calder, made an excursion to the Concorado Mountains. Always on the alert for languages, as well as for facts, he made his first acquaintance with Portuguese during those weeks. Owing to the detention, the ship lost the monsoon, and encountered contrary winds. Writing from Prince of Wales Island, on the 29th January, 1808, Arnott says, "just arrived after a disastrous voyage of five months from Rio." He landed at the Cape, and climbed the Table Mountain. On the 20th August he dates from Macao Roads. He commemorates his being

* He farther contributed to the pleasure of the ship's company by playing on his fiddle to the dancing of the sailors. As a joke, he learnt from Calder the words and music of a Gaelic song, and sang it to prove that he was a genuine Highlander. He afterwards repeated the song to his mother, who vouched for its being correctly learnt.

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in the Straits of Malacca, and ascending the central height of Pielo Penang, and the highest points of the islands near Canton. Landing in China, he made good use of his time, observing the country and the natives, and picking up the vocabulary. In the "Physics" he records how he confounded a Chinese sutler, who sold brandy to the ship, by telling him the exact degree that he had watered it. There are no further memoranda of this voyage, except a few dates on the return. On the 22nd January, 1809, he was at the Cape, and on the 14th May, off Falmouth; a few days later the ship was in the Thames. His father had come to meet him in London, and on the 29th of June, the two set sail for Aberdeen. He spends two or three months with his family and relatives, and returns to London in November, to give himself up during the winter to classes, with a view to complete his medical studies; it being decided that he should again join the "Surat Castle" in spring for another voyage. In a letter of the 21st December, he communicates the date fixed for starting and the appointments to the ship; Mackintosh was to be with him again. *Apropos* of his studies, he mentions that he is attending the class of Sir Charles Bell.

On this second voyage, Robertson is again captain; the four lieutenants are all changed; Arnott is surgeon, and Mackintosh purser. The ship sailed from Portsmouth on the 28th April, 1810. Before leaving he visits his uncle, Charles Arnott, in the New Forest, for the first and last time; writes a letter to a younger brother (John, entering on the law), with good advice in the matter of persevering study; on the 26th sends "good-bye" to his family; on the 12th of June he writes home an account of the observances on crossing the line; on the 26th of September he dates from Malacca Roads, expects to be in China in 14 days, and mentions the captain's bad state of health; the old ailment, on whose account he had pressed Arnott's appointment, giving him trouble. It appears that, in consequence of a typhoon in the China Sea, anxiety of mind had made the stricture utterly intractable, and Arnott saw no help except by a bold and then almost original operation—cutting into the bladder by the perineum.* He expressed his wish to perform this

* From what I remember of his own account given in conversation, this was the phrase used by him in describing the operation. Dr. James Arnott is of opinion that it was either cutting into the urethra behind the stricture or cutting through the stricture. Ten years afterwards Sir Charles Bell recommended the last-named operation, and it was at a later period adopted and improved upon by Mr. Syme. It has been nearly superseded by the process of lateral dilation, which was first used by Dr. Arnott upon the same patient eight years after the original operation.

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incision, but desired also the presence of some other surgeons from the fleet of Indiamen assembled in the roads. He obtained a consultation, but the other surgeons would not take the responsibility of advising the operation, and it was not then performed. The captain's state of anguish at last became insupportable, and he insisted on Arnott operating by himself, which he did with perfect success. The impression left by this incident told in Arnott's favour, and was a turning-point in his career. At the abortive consultation of the surgeons, he made the acquaintance of one named Darling, with whom he contracted further relations.

On the 20th January, 1811, he writes from Canton, "having arrived too late at Penang, we lost the S.W. monsoon, and are not now ready to sail with the returning fleet." No particulars of the return home. On the 14th September, "off the Land's End, full wind;" on the 29th the ship arrived at Portsmouth.

In this voyage the "Surat Castle" brought home invalid troops from India belonging to the Duke of Kent's Regiment. They were under the medical charge of Arnott as surgeon of the ship. It seems that, while sickness prevailed in other ships coming home at the time, Arnott had lost only one man, hopelessly diseased. In consequence of the report of the officer that commanded them, Arnott received, on his return to England, a most flattering letter of thanks from the military authorities. He already, as in after life, depended more upon general management of the sick than upon medicines, carefully regulating what he subsequently termed the four great necessaries—Food, Warmth, Air, Exercise. He soon began to employ means for ventilating the ship. Out of sails he made two funnel-shaped tubes, having openings at one side, which were duly turned away from the wind. These communicated with the lower decks; one admitted fresh air, the other discharged the foul air. They were named by the sailors "the Doctor's duck trousers."

Readers of the "Physics" are well aware what use he made of the observations and incidents of his two voyages in illustrating the various doctrines of Natural Philosophy. The accumulated materials did not long continue dormant in his hands.

On the 10th October, 1811, he dates from 14 Sackville Street, Piccadilly. He felt now in a position to commence practice in London. Through his captain, whose life he had saved, and other connections, he was well introduced from the very first. He was aided by Roman Catholic influence, and this, coupled with his

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facility in acquiring languages, enabled him to make way among resident foreigners. He already knew French and Italian, and, after settling in London, learnt Spanish.

He entered into partnership with Darling, and they took the house, No. 1 Hunter Street, Brunswick Square, even then a crowded neighbourhood. Close by is Somers Town, which was the chief abode of the French refugees, who had come to London after the Revolution. Arnott soon became their physician, through an introduction from the Catholic priests. These refugees contained the flower of the old French nobles, and their deportment would be very improving to a young man eagerly disposed to cultivate himself in everything that could favour his success. Through the same means he obtained an early connection with the artistes of the Italian opera.

When he commenced practice, his title consisted in his having been full surgeon in the East India service. In the course of a few months he obtained the diploma of the College of Surgeons, "examined and admitted 5th February, 1813." At the same time, he projects an ambitious course of public lectures in the neighbouring popular institution, called the Philomathic Institution, in Burton Street, Burton Crescent, proving how thoroughly he had set his mind upon scientific exposition. It was fortunate for him to find so speedy an opening for his powers, supplying him with a stimulus to exertion before he was overwhelmed with professional work. The course was entitled, "Lectures on Chemistry and Natural Philosophy, by N. Arnott, A.M., Member of the Royal College of Surgeons; to begin on the 17th February, 1813, and go on for ten weeks, two lectures a-week. Ticket for the course, one guinea."

The course was a great success. The audience numbered from two to three hundred. Probably the Institution already possessed apparatus, which, by help of his own ingenuity and contrivance, could enable him to fulfil the promise of liberal experimental illustration. His voice was neither sweet nor strong; but in every other respect he made a good lecturer. A ready flow of simple and precise language, an abundance of happy examples and comparisons, animation and emphasis of manner, all contributed to engage the attention of his audience.

From the printed prospectus we find that three lectures were nominally devoted to Chemistry; but after a general view of the

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Universe, as made up particles of matter, under the influence of attractive forces, he took up Heat, and its applications to fires, clothing, cooking, &c., and followed with Electricity. Five lectures were devoted to the examination of the constituent materials of the globe, and the part that they play in nature and in the arts, &c.; the subjects being the Atmosphere, the Ocean, the solid mineral constituents of the globe—the earths, alkalies, metals, and the other simple bodies (called non-metals or metalloids)—carbon, sulphur, &c.; and to a comprehensive sketch of Physical Geography. Two very summary lectures embraced the interesting products of the vegetable and animal kingdom. Then followed probably the best part of the whole—eight lectures on Mechanical Philosophy, comprising mechanics, hydrostatics, hydraulics, pneumatics, optics, magnetism, astronomy. It is said that, at the end of the course, he received as a testimonial a valuable set of philosophical apparatus.

He was now prospering in his profession, and his next step was to apply to the Marischal College and University for the degree of M.D. There being no teaching medical school in the University, while yet the Senatus had the power of granting medical degrees, the mode of exercising this power was to require that the applicant should be already in practice under a diploma from some of the other graduating bodies, and that he should be backed by a recommendation from two known medical men. Under this system, the University was in the habit of conferring every year perhaps ten or fifteen diplomas. Although the system was carried out in perfect good faith, and with a wish to promote only deserving practitioners, it was clearly open to abuse, and in the end incurred much opprobrium. The crowning instance usually quoted was Dr. Solomon, who made a large fortune by "drops" and other concoctions, which even the poor bought at an enormous price (half-a-guinea for a bottle less than half-a-pint). When, at a later period, the University instituted a teaching Faculty of Medicine, the granting of degrees upon mere recommendations was given up, and the strictness of the examinations gradually redeemed Marischal College from its reproach.

Arnott's application came before the Faculty on the 10th August, 1814. In the minute he is styled, "Mr. Neil Arnott, formerly a student in this University." All applications were laid on the table at one meeting and disposed of at the next. On the

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13th September, the minute runs—"The Faculty, perfectly satisfied with the ample testimonials laid before them, granted the degree." What the testimonials were is not stated, although the rule was to enter in the minutes the names of the medical men recommending the candidate, always two, and occasionally three or more. The inference is that the body acted on their own personal knowledge of Arnott as a former student, all his professors being still present. He may have recited some of the facts of his past career.

We are now prepared for what is given in a letter not long after (27th December): "Darling and I go on most satisfactorily, increasing our professional connection. We go into a new house soon. I am to be appointed physician to the French Embassy." This was the year of the Restoration in France, and doubtless his French friends in Somers Town used their influence to recommend him to the Embassy as re-constituted by the new Government. Early in the following year (1815), dating from the new house, 29 Brunswick Square, he writes, "We have got a carriage." The actual appointment to the Embassy is not mentioned till the following year, in a letter dated 23rd July, 1816. Another soon follows (13th August), saying, "in a month I go to Bedford Square." Darling had married in the meantime, the partnership was dissolved not long after, and Arnott ventured alone into the large house, 38 Bedford Square, where he remained to the end of his professional life, more than forty years.

We do not know how long he remained physician to the French Embassy, nor when he was appointed to the Spanish Embassy. It is certain that after a time he held both together, and was always on the best terms with the French diplomatic body. He retained the Spanish Embassy to the end of his professional life, and contracted an extensive acquaintance among Spaniards, whether residents or visitors. He spoke Spanish with great ease. He enjoyed during his whole stay in Bedford Square the exemption from local taxes acceded to the foreign Embassies.

Few incidents are recorded of his career for the next seven or eight years. His letters that have been preserved show his constant attention to his mother and family. In 1823, we approach the principal epoch of his life, the preparation and publication of the "Physics." It appears that Sir David Barry was about this time propagating views respecting the circulation of blood that were the subject of discussion in the medical societies. He maintained that

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the propulsion of the blood from the heart through the capillaries, and back by the veins, was due to atmospheric pressure. He was opposed by Dr. Armstrong, who pressed Dr. Arnott to his aid. This was the immediate occasion that led to the cause of lectures on "Medical Physics," given by Dr. Arnott, in his own house, in the end of 1825.

The plan of these lectures is new. I had before me the prospectus when this sketch was drawn out, and had marked a passage, without transferring it at the time to my copy. The original has, unfortunately, slipped out of sight, and may never be recovered. I had, however, transcribed the following very shrewd and true remark :—"Natural Philosophy has this peculiar to it, that with less labour it bestows a more important mass of information than any other study."

The medical subjects were Skeleton, Circulation, Respiration, Digestion, Urinary System, Pregnancy, Eye, Ear, Surgical and Medical Apparatus.

The lectures made a great impression, and there was a strong desire expressed that he should repeat them. Instead of this he devoted himself for the next two years to the composition of the first volume of his great work. The effort was very great in the state of his practice at that time, but his physical vigour carried him through the days and nights of labour that it cost.

The first volume of the "Physics" was published on the 1st of March, 1827. It was received with a burst of unanimous commendation, such as never was given to any scientific work before or since.* The periodicals vied with each other in seeking terms strong enough to set forth the originality of the design, the depth of the reasoning, the perspicuity of the language, the fulness and interest of the illustrations, the value of the applications to practice. The

* The following will serve as specimens, and will show what were the first impressions of the work :—"These volumes cannot fail to generate and diffuse an ardent desire for the study of Natural Philosophy—the most delightful, as well as the most comprehensive, circle in the sciences. Dr. Arnott has contrived to invest Physics with the charms of poetry and romance, and to melt down the rugged and uncouth technicalities into language the most smooth, energetic, and harmonious.—*Lancet.*

"This great desideratum (the simplifying of the greatly increased knowledge of our day), as far as the elements of Physics are concerned, Dr. Arnott has at length supplied; and that with a degree of success and completeness, not merely which has never before been arrived at, but which, we may venture to predict, will not be surpassed. This book has the strong and peculiar merit that, though a book of immense labour, all the labour has been taken by the author."—*Times.*

"Of all living persons that we know of, we believe Dr. Arnott to be in the highest degree qualified to impart knowledge agreeably and successfully."—*Examiner.*

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abstention from technical phraseology and mathematical formulæ was thorough-going, and yet left upon the subject the genuine impress of science.

A second edition was printed in December, the same year; a third in the following year, 1828; a fourth, in 1829. In November of 1829, appeared Part I. of the second volume. In 1833 was published a fifth edition of the first volume, together with Part I. of the second. The author intended to introduce considerable improvements before printing a sixth edition, but his many distracting avocations prevented him. The book went out of print, and copies were being sold at a premium. It became a standing joke with his friends to ask when his new edition was coming out. It did not appear till 1864. In later life he was somewhat desultory in his studies.

The work was speedily translated into French, German, Dutch, and Spanish. The title was a novelty in England, being borrowed from the French *Physique*. The author admitted that the word was chosen from its convenient ambiguity. By suggesting a medical meaning, it obviated the common prejudice against a professional man that should give his attention to subjects removed from his profession.

The stimulus to individual minds from the perusal of the "Physics" was almost without a parallel. To many it was the opening of a new career, and everywhere may be encountered individuals who look back to it as an epoch in their life. The commanding generalities of the Introduction were novel; the author's views of the Classification of Knowledge were in advance of anything then published. He devoted a considerable portion of the first edition to the medical bearings of Natural Philosophy; but when he found the book so popular with general readers, he withdrew much of this part, intending it to be published separately.

Of his various inventions the Heat Transferrer was fully described in the work, while others were foreshadowed. It had thus the rare distinction of uniting the two extremes—speculation and practice.

The Hydrostatic Bed was devised in 1832 in connection with a case occurring in his practice. A lady that, after a bad confinement, passed through a succession of prostrating ailments, suffered from sloughing sores in all parts where she pressed in bed. Attempts were made to release her by air pillows, but even these killed the

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flesh. It was then that the idea of a water bed rose in Dr. Arnott's fertile mind. He forthwith had one constructed, and the moment the patient was placed upon it she felt relieved; sleep soon came to her; she awoke refreshed; the sores soon began to heal; and she finally recovered. The bed has since been steadily used, and has saved many lives. It was taken notice of, and introduced, on the Continent, but probably its value is not yet fully recognised.

Besides the increased professional connection due to the reputation of his book, much of his time was now spent upon the various inventions in Warming and Ventilation that are connected with his name. By his own account, "the incidents of his professional life drew his attention early to the sanitary importance of ventilation and regulation of temperature," and his familiarity with mechanical arrangements increased while he was composing the "Physics," so as to suggest simpler and more effectual methods of attaining both objects. In the year 1834, he farther tells us, various professional occurrences directed his attention to the important art of controlling the temperature of dwellings; and he began to make experiments in his own house. His first trial was with hot water pipes, a mode of heating that has many advantages, but it does not realise the grand desideratum of giving uniform temperature by self-acting means. It was to secure this great object that he speedily contrived his close stove, with a regulator for the admission of the air. In a lecture before the Royal Institution, on the 11th March, 1836, he gave the first account of the stove, and exhibited one in operation. From that date stoves began to be manufactured, but not for some time to the satisfaction of the inventor. In 1838 he published his work on "Warming and Ventilation," in which he reviewed all the existing modes of warming and ventilating, and described the stove at length, giving a variety of forms of the essential apparatus—the heat governor or regulator. In the preface, he announces his reasons for declining to take a patent for this or any of his other inventions.

The stove soon came into use, although not so extensively as the author might have reasonably expected. Wherever it was fairly tried, it succeeded. The only real drawback to its utility is, that it is not adapted for burning the ordinary flaming coal; only the Welsh anthracite, or else gas coke, will answer. In places where anthracite is procurable, its management is perfectly simple. It maintains an equable heat, and never goes out, night or day. It is fed once, or at most twice, in twenty-four hours. Where anthracite is not to be

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had, the substitute is the gas coke or cinder. When this alone is used, the stove needs to be fed three times a-day.

He became a Fellow of the Royal Society in 1838, and sat twice on the Council. The same year he was appointed "Physician Extraordinary" to the Queen.

Dr Arnott was one of the zealous advocates and expounders of Sanitary Reform. In 1838, a report on the fevers of London was presented to the Poor Law Commissioners, drawn up by him in conjunction with Dr. Kay and Dr. Southwood Smith. Especial stress was laid upon the purity of the air as a means of preventing disease. Again, in 1840, after a visit of inspection to the fever nests in Edinburgh and in Glasgow, he made still farther application of the same views. These reports co-operated with the labours of Mr. Chadwick in hastening the movement for the sanitary improvement of towns and habitations generally.

From 1838 to 1855, Dr. Arnott was in the height of his professional career. He had always on hand some invention or project; he was frequently consulted on public matters; yet the greater part of his strength was devoted to his profession. He was, at the same time, much in society. For a number of years, during the summer season, he received a gentlemen party at his own house every Thursday to dinner. His intimate London friends had a standing invitation, and there were special guests on every occasion. At these dinners might be seen Edwin Chadwick, Wheatstone, G. L. Craik, G. H. Lewes, William Ellis, Rowland Hill and his brothers, Sir James Clark, Dr. Sharpey, Dr. Alfred Taylor, Professor Graham, William Chambers, Robert Chambers, James Simpson (of Edinburgh), John Robertson, David Masson, Andrew Bisset, R. W. Mackay, Dr. Boswell Reid.

In 1846, he was asked to advise on the warming and ventilating of the Brompton Hospital for Consumption, and was considered to have been very successful in securing a fresh atmosphere of uniform temperature in the building. In 1849, he gave a plan for ventilating the new York Hospital on the great scale. He devised a ventilating gasometer pump, with the view of adjusting the quantity of fresh air to the demands of the patients. With adequate power, steam or power, this pump is very effectual; but the attempt to use it for ventilating rooms, with no other force but a weight, did not answer.

The chimney ventilating valve, the most universally adopted of all Dr. Arnott's inventions, was not described in the first edition of

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the book on Warming. It must have been invented soon after. It was in extensive use about 1842, and a clause was introduced into the Metropolitan Buildings' Regulations permitting openings to be made in chimneys (otherwise prohibited by the Act), for the insertion of the ventilators. For utilising the chimney draught to carry off the polluted air at the top of a room, this is a very happy and efficient contrivance, and fails only in ill-built chimneys, which, from feebleness of draught, allow smoke to pass into the room.

In 1848, a destructive gas explosion in Albany Street, Regent's Park, was made the subject of a valuable letter to the *Times* (reprinted in the new edition of "Warming and Ventilation,") explaining the nature of the casualty, and the precautions to be taken in houses to avoid such dangers.

At the great Exhibition of 1851, he acted as a juror in the section on "Civil Engineering, Architectural and Building Contrivances," and devoted much activity to the work of the section.

In 1852, he gave evidence before a Select Committee of the House of Commons on the warming and ventilating of the House. It was about this time that the system of Dr. Reid was regarded with dissatisfaction; while the standing disagreement between Reid and the architect, Barry, rendered it advisable to put the ventilation into other hands.

In 1853, he was deputed by the Secretary of State, Lord Palmerston, in conjunction with Mr. Thomas Page, civil engineer, to enquire into an outbreak of disease at Croydon, consequent on the new drainage works constructed under the Public Health Act. Croydon is one of those places affording no outfall, and the attempt to dispose of the sewage by filtration in a common reservoir was at first very unsuccessful.

From about the year 1850, Dr. Arnott often mentioned his wish to retire from practice and to give himself up to the completion of his "Physics" and other works. He struggled to free himself of his numerous professional ties, and resisted all new connections, but it was not till 1855 that he succeeded in emancipating himself. In the following year, 1856, he married Mrs. Knight, the widow of one of his oldest friends. She was the only daughter of a country gentleman in Norfolk, James Hunt Holley, of Bleckling, and is the sister of James Hunt Holley, of Oaklands, Devonshire. The marriage was in every way suitable. When the Doctor's unfortunate deafness precluded him from ready conversa-

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tion with friends and from general society, he found sources of pleasure in his own home. He would read aloud to his wife; and one of his favourite books was Don Quixote, in the original Spanish, which both understood.

When the University of London was founded in 1836, Dr. Arnott was placed on the Senate (appointed by the Crown), as a representative of the medical profession. He attended the meetings of the Senate with great regularity for many years, and took part in the planning of the examinations for degrees in medicine. He was not an adept at ordinary business, but was always ready to urge advanced views as to education, and to stand by the unsectarian principles of the University of London, which were endangered for a time by the mistaken zeal of Dr. Arnold.

In the scheme of degrees in Science, passed in 1859, Dr. Arnott took a prominent part as a member of the committee appointed to consider the whole subject. He was specially requested by the committee "to draw up a scheme of examinations suitable for the degrees of B.Sc. and D.Sc." He presented a scheme accordingly, grounded upon a comprehensive view of the sciences, such as he gave in the introduction to the "Physics." The committee took the scheme as the basis of their deliberations, and, with a few modifications, it was adopted by the Senate.

In 1854, he was requested by the President of the General Board of Health to become a member of the Medical Council, and with reference to the outbreak of cholera that year, he submitted to the Council a report "On Asiatic Cholera and other Diseases, as Influenced by Atmospheric Impurity."

In 1855, he brought out a new edition of the work on Warming and Ventilation under a somewhat altered title. It contained an account of his latest invention in warming—The Smokeless Grate: a modification of the open fire, which had many of the advantages of the stove. In this grate, there is a thorough combustion of the smoke, an economy of fuel, and a remarkable steadiness and endurance in the fire itself. The coal is put on in the morning once for all; it falls into a pit below the level of the exposed front, and rests on a moveable bottom, this bottom, raised at intervals by a rack, brings the coal within reach of the combustion. The grate is suited to ordinary coal, and is free from any practical difficulties that would impede its working, while it possesses important points of superiority to any other kind of grate yet devised. In a lecture

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to the Society of Arts in May, 1854, he expounded the principles of the grate, and exhibited its working. Among the speakers that followed, the celebrated chemist, Dr. Hoffman, strongly applauded the invention.

It was on the consummation of this invention that, in 1854, the Royal Society awarded him the Rumford Medal. The President, in conferring the medal, stating to him the grounds of the distinction in these words, "for your construction of a new smoke-consuming and fuel-saving fireplace, with accessories, ensuring the healthful warming and ventilation of houses, lately described in the Journal of the Society of Arts (May 12, 1854), and for your various contributions to the elucidation of the principles and improvement of the practice of heating and ventilation."*

Wishing to show his gratitude to his Alma Mater, Marischal College, in a way that would promote the study of the science that he owed so much to, Dr. Arnott, in 1859, wrote to Provost Webster of Aberdeen, offering to the Professor of Natural Philosophy an endowment for teaching evening classes in the College. As this proposal could not be carried out, he manifested his goodwill in another form, namely, by providing a scholarship in the University (subsequent to the union of King's and Marischal Colleges). At first he gave tentatively a sum of £50, in three successive years, and finally in 1869 presented £1000 to endow the scholarship in perpetuity. He did not confine his munificence to Aberdeen, but gave also to the three other Scotch Universities, each £1000, for the like purpose. About the same time he placed in the hands of Mr. Grote, Vice-Chancellor of the University of London, £2000, to found a scholarship in connection with the examinations in Natural Philosophy. By a minute of the Senate, dated 3rd March, 1869, it was resolved to institute an Exhibition and Medal, for proficiency in Experimental Physics, at the Honours' Examination for First B.Sc. and Preliminary Scientific M.B.—the Exhibition being of the amount of £40 per annum, tenable for two years. The minute farther bore—"That in accepting this munificent present, the Senate desire to record their grateful sense of Dr. Arnott's enlightened liberality, as well as the

* From the language used by Count Rumford in providing this medal, its bestowal was peculiarly appropriate in the present instance. "New discoveries tending to improve the theories of heat, of light, and of colours, and to new inventions by which the generation, and the preservation, and the management of heat and of light, may be facilitated. More particularly, such practical improvements in the generation and management of heat and light as tend directly and powerfully to increase the enjoyments and comforts of life, especially in the lower and more numerous classes of society."

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satisfaction which they feel in associating their recompense in Experimental Physics with the name of a member of their body who has contributed so powerfully both to the lucid exposition of Physical Science in theory and to the useful applications of it to practice."

At the annual meeting of the Convocation of the University, a resolution was passed to the effect:—"That Convocation desires to express its warm sense of Dr. Neil Arnott's munificent generosity, and of the importance of the purpose for which the sum presented by him to the University is to be employed; and that the Chairman of Convocation be requested to forward a copy of this resolution to Dr. Arnott." At the presentation for degrees, Lord Granville, as Chancellor, alluded to the gift in graceful and flattering terms.

Mrs. Arnott followed up her husband's example with a view to the improvement of her own sex, and, in 1865, presented two Ladies' Colleges in London with £1000 each, to found scholarships for encouraging the study of Natural Philosophy among the pupils.

For Aberdeen especially he added a farther gift of £500, to endow an evening lecturer on Natural Philosophy in the Mechanics' Institution.

He acted as a juror in the Paris Exhibition of 1855. In the Report on the 12th Class (Hygiène, &c.), the Committee of Jurors, in recounting his discoveries and recommending him for the Gold Medal, to which the Emperor added the Cross of the Legion of Honour, speak thus:—"Dr. Arnott, by his inventive genius, by his profound knowledge of the physical sciences, of which his useful applications to medicine and to hygiene exceed those of any other man, by the originality of his views and the fruitfulness of his methods, has made for himself a place apart, and has inscribed his name in the ranks of those that have rendered the most incontestable services to their fellow-men."

On his return from the Exhibition, he wrote a report to Lord Stanley of Alderley, President of the Board of Trade, containing his notes and reflections as a Juror, and describing some of the most important plans adopted in Paris for warming and ventilating large buildings.

In 1859, the British Association met at Aberdeen, the meeting having been brought about at the instance of Provost Webster, whose family had been on terms of intimacy with Dr. Arnott's family in the years of their residence in Aberdeen. Accordingly he was strongly urged to be the Provost's guest on the occasion, and to

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revisit his early haunts: he had not seen Aberdeen for probably forty years. Accordingly he was present at the Association. On returning south, he travelled to Edinburgh alone. He fell asleep in the train, and a fellow-passenger opened the window beside him. The consequence was a severe inflammatory attack in the throat and passages to the ear, which impaired his hearing for the rest of his life. His usual ingenuity helped him to palliate the calamity. Procuring two wooden cups about two inches in diameter, he mounted them behind his ears as reverberating shells, and they stood in the place of an ear-trumpet. But as years advanced the deafness gradually increased, until he could hear only familiar voices and by the help of a trumpet. His habits in consequence underwent a great change; his extreme sociability, which up to that time was fresh and unabated, henceforth drooped into a more and more confined intercourse, depending at last on the society of his wife.

Although occupying himself after his retirement in revising the "Physics," and in preparing the two unpublished sections—Electricity and Astronomy—he brought out in the first instance his "Survey of Human Progress." The first edition was published in 1861, the second in 1862. The work is highly characteristic of the author. He was fond of sketching the progress of human society: the superiority of the civilised man, the progress in Arts, Politics, Morality, and Religion; the special advances made during the present century, and the prospective improvement in human happiness from farther enlightenment. He gives his views on Education, treating all the vexed questions in his own way, He prefers the mother tongue to the classics, although admitting these in certain measure, if taught in a better way. He was a great admirer of the methods of Cominius for learning languages, and was indeed a kindred genius to that remarkable man, of whom Professor Masson has given an interesting account in the third volume of his "Life of Milton." He deplored sectarian differences in religion, as the great drawback to sound moral education; and dwells with some emphasis on the exclusive connection with belief with early education. As a matter of course, he urges the pre-eminent value of the fundamental sciences—(Physics, Chemistry, Biology, Mind)—and to these would add a training in Political Economy, wherein he took very much the track followed in the Social Economy of William Ellis, showing that both prudence to ourselves and our duties to others might be effectively based on a knowledge of the laws of production and wealth.

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Although the work had all the author's charms of style and his peculiar vein of thought, and commended itself to those holding advanced views, it encountered hostile critics. The *Economist* pronounced it "cramped by some of the narrowest theories of the utilitarian schools." He was, however, sufficiently flattered by the approval of many friends. Sir John Herschell calls it a work "which I shall read with much interest, as I do everything which proceeds from your pen." His friend Mr. Mackay, in a very interesting letter, remonstrates with him for not doing justice to the scholars who brought about the revival of learning; for citing the precepts, "Love your neighbour," "Do unto others," as of Christian origin; for treating intellectual discipline too much as the cramming of mere knowledge, and for speaking disparagingly of the pagan world.

In the great Exhibition of 1862, Dr. Arnott sat on the jury of the section on "Sanitary Improvements and Constructions," and drew up that portion of the report bearing on the general subjects of ventilation and warming (page 7). He puts great stress on the use of the chimney valve in ventilation, and gives a description of his Heat-transferrer apparatus.

At last, in 1864, appeared the first half of the sixth edition of the "Physics," and in 1865, the second half, with the additional chapters. The new subjects, Electricity and Astronomy, were treated in the same popular style as the older portions. The appendix on Popular Geometry was a novelty in every sense, and was a happy extension of the author's manner of giving a concrete handling to abstract subjects.

Notwithstanding that thirty years had elapsed since the previous edition was exhausted, during which time an immense number of manuals had appeared, the new edition was well received. With one or two exceptions, the notices of the work repeated the same strain of laudation as before. Among many private testimonies it is sufficient to quote a sentence from Sir John Herschell, "I have always regarded your 'Physics' as one of the most useful, perhaps the most useful, popular works on science."

Special commendation was bestowed on the chapter on Popular Mathematics. Thomas Graham, the chemist, said of it, "I have rarely seen so much sound and valuable information brought together in so clear a manner and in so small a space.

In continuation of his attempt to popularise the foundations of Geometry, he occupied himself, after the publication of the

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"Physics," with the simplification of arithmetic, and in 1867 published a short tract on the subject. In thirty-two pages he reviews all the leading processes of arithmetic, and provides intelligible reasons for each, putting special stress upon the *decimal notation* as the key to the whole. The system will compare to advantage with the very best works on Arithmetic.

Dr. Arnott was now verging on fourscore, and yet preserved much of his old intellectual habits. He had still to complete a small separate work on "Medical Physics," having detached from the general work all the medical applications. This, unfortunately, he never executed, so that his medical inventions and views have not been brought together.

His farewell as an author was taken on his favourite theme, Education. He was roused to it by the public agitation in favour of a national system. In 1870, he brought out a short pamphlet entitled "Observations on the Fundamental Principles and some Existing Defects of National Education." He went over shortly the circle of useful knowledge and its bearings on human happiness; but, although to the last, he found fresh modes of expressing and illustrating his views, he advanced nothing that was essentially novel. The tract was respectfully noticed by the press, and various men of note recognised in it something of the author's old fire.

In consequence of the growing opinion in favour of combining in the Colleges practical laboratory teaching with class lectures in Natural Philosophy, Dr. Arnott intimated, in 1871, through Dr. Lyon Playfair, his wish to make a second gift of £1,000 to each of the four Scottish Universities, in furtherance of this object. His intention was not carried out at the time. Owing to an unfortunate fall his brain was severely concussed, and his mind greatly weakened; he became henceforth incapable of sustained thought or resolution. Soon after his death Mrs. Arnott, of her own accord, presented to all the Universities the sums promised, stipulating only that the objects contemplated by her husband should be faithfully attended to.

He died at his house in London, on the 2nd March, 1874, having nearly completed his eighty-sixth year. By his own desire he was buried in the Dean Cemetery, Edinburgh, where already lay his mother and other members of his family. In accordance with his design and the wishes expressed to his widow, an obelisk has been erected in commemoration of himself and them.

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Dr. Arnott's character may be summed up thus:—Physically he was of a remarkably strong build. Somewhat under the middle size, he was large in bone and muscle, without being clumsy, broad chested and never obese. Every organ in his body was sound, which is but another way of expressing his remarkable physical energy and endurance, his unbroken health, the basis of his untiring activity and industry. During more than sixty years he lived in the heart of London, and never sought a holiday; on one occasion he went to Switzerland for a fortnight, after much pressure from the friend that accompanied him. At distant intervals, and on the occurrence of some event, he visited his family in Edinburgh for two days at a time: and he went occasionally to the British Association: these and one or two other incidental visits, always brief, were the only intermissions of his life in London.

His head bespoke power and feeling in a way that could not be mistaken. Of the large finely-shaped cranium and the expressive features some faint notion may be gathered from the portraits, while it is a matter of regret that they have not been rendered in a bust.* His hair was originally dark; his complexion olive with the pink hue of perfect health. Until late in life his teeth were perfect.

Delicacy in the use of his hands he possessed in a remarkable degree. Every manual exercise that he took up he excelled in: handling tools, drawing, playing upon musical instruments, games of handicraft skill (as billiards), and finally the mechanical parts of his profession. As implicated in these gifts, he had a fine eye for form; but if we may judge from his comparative indifference to painting as a fine art, he had probably only a moderate sense of colour. He had a fine ear, owing to which and to his good hands, he could play on a variety of instruments; at first he practised the violin and the flute, and musical glasses; after Wheatstone invented the concertina, he took to it by preference. His good ear and his familiar intercourse with polished society made him an easy and graceful converser, an effect increased by his natural warmth and kindliness.

His gift of languages was remarkable. Both by the ear and from books, he imbibed language with special facility. He had a good command of choice English both by tongue and by pen, and took a pleasure in shaping and turning his sentences for the purpose of perspicuous exposition; and he spoke fluently French, Italian,

* There is, in the Royal Society, a crayon drawing of him, life size, by Mrs. William Carpenter: also, in Marischal College, Aberdeen, a portrait in oil by Partridge.

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and Spanish. When he received the German translation of the "Physics" he began upon it the study of German, and was very soon able to decipher a German author.

By temperament Dr. Arnott was naturally happy, sanguine, and buoyant, not afflicted with moodiness or depression, unless very much thwarted or disturbed. He was also intensely sociable; he had the hearty, frank, overflowing manner, marking the sociable disposition. He had a great fund of natural kindness and amiability, shown in being ready to oblige and assist as opportunity presented itself, and in large-minded and philanthropic aims and purposes.

His fine intellect was unusually versatile. It embraced, in the first place, languages, and next science, both in its speculative generalities and in its practical applications. He had a clear mastery of principles, and a unique command of illustrative examples. Natural Philosophy in his hands took that happy middle flight adapted both for training and for utility. Many of his inventions occurred to him while studying and developing the principles of his favourite science.

His resources as an inventor are shown by the elaborate mechanism of the stove and the smokeless grate, and by the numerous other contrivances associated with his name. But in the emergencies of the sick-room he was ever ready with some ingenious device. On one occasion, a lady patient was suffering from brain fever, the brain was so susceptible that it could not bear ice to be applied, and yet cooling was essential. Dr. Arnott spread a cambric handkerchief over her head, and by a thread of worsted connected this with a jar of iced water. By the capillary attraction of the worsted the handkerchief was constantly moistened with the iced water, and through this gentle application the fever was gradually subdued. A child was brought to him afflicted with inability to bend up the toes of one foot, so that the foot dragged. To the back of a light chair mounted on wheels he suspended a stirrup by an elastic cord; the child put its toes into the stirrup, by which they were supported, and by pushing the chair forward was enabled to walk.

Had he devoted himself exclusively to surgery or to midwifery, he would certainly have enriched either department with original methods of treatment, and gained the highest professional eminence. He could not, however, be induced by lucrative considerations to depart from the course that he had once entered upon. As a

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physician he depended more upon regimen, in the construction that he put upon it, than upon drugs.

He suggested, as a mode of reducing cancerous swellings, the application of air pressure by the slack cushion. Being somewhat troublesome, the method was not generally adopted, but it is spoken of with great commendation by Dr. Walshe in his work on Cancer.

The improved treatment of stricture is due, in great degree, to Dr. Arnott's introduction of instruments that dilate by lateral pressure.

Among his less known inventions is the "Rupture Truss with Screw Adjustments," described in 1853 by Mr. R. Quain as effectual in cases where all the ordinary trusses had failed.

He anticipated the greatest practical invention connected with iron smelting, the hot blast. He described a breath warmer long before the introduction of the so-called respirators.

He was never without some new project or invention that he was occupied in maturing. Among his latest endeavours was to devise a remedy for sea-sickness, the proposal being to suspend a chair (or it might be a whole cabin) by some elastic body that would yield to the pitching of the ship. Another favourite notion of his last years was a floating breakwater of vertical sluices at different distances from one another, and increasing in depth so as gradually to arrest the waves from below.

All his life he had a fondness for political and social economy directed immediately towards human improvement. His love of progress was of the most ardent kind; he could never refrain from introducing the subject into his scientific works. He warmed into eloquence whenever he touched this theme. It was the delight of his life to devise means of ameliorating suffering and adding to human comfort.

His kindly and amiable spirit pervaded his written compositions. However he might feel under provocation, his response was dignified and courteous. It would be difficult to quote such a combination of suavity in manner with severity in substance as his criticism of the mistakes of Charles Bell in the "Useful Knowledge Treatise on Animal Mechanics."

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April 25, 1882.—Dr. BEVERIDGE *in the Chair.*

W. J. SIMPSON, M.D., read a paper on "Health History of Aberdeen during the Past Quarter of a Century."

I HAVE chosen for this evening a subject in which all here to-night will have an interest; it is a short review of the health history of Aberdeen for nearly a quarter of a century. Such a retrospect of the state of public health is instructive, in that it gives us definite ideas as to whether the town, while increasing in size, is improving or deteriorating in health. If improving we may learn what contributed to that desirable condition, and also whether there are not yet circumstances which give hopes of still further improvement. If deteriorating, however, then, with the knowledge of what has been recently brought to light in sanitary science, it behoves those who have the welfare of the citizens in their charge to bestir themselves, and not rest satisfied until a change for the better has been made. A record of the facts will be useful in another way, for it will form a basis of comparison for future years.

The only materials at hand for such an enquiry are the Registrar-General's Reports, which began to be issued for Scotland about the middle of 1855. Before that time there were no means of estimating, with anything like accuracy, the health of Scotland or any particular town in it; unlike England in this respect, which had its Registration Act passed so long back as 1838.

It is not affirmed that deaths alone give an absolutely accurate idea of the general health in town or country, for there are many forms of chronic ill-health that do not cause death—the sufferers live on, and ultimately die of some other disease. A district may be rheumatic or aguish, and yet not appear in the death reports as an unhealthy district; yet, even with such drawbacks, the deaths, when compared for a series of years, furnish a very fairly approximate indication of the state of health in any particular place.

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This then is what has to be done with the deaths in Aberdeen—a series of years will be gone over and compared. As the area of registration in Aberdeen was changed in 1857, not much note will be taken of the two years of registration, 1855 and 1856.

In order that the deaths in the several years may be accurately compared, they have been brought to a common standard. The usual mode of expressing the yearly death-rate is the number of deaths in 1,000 living. But for greater clearness, and easier comparison, the yearly death-rate is here expressed by the number of deaths in 100,000.

The actual number of deaths that occurred in the several years have been also put down without reference to population. The death-rate per 100,000 is indicated by the dark line, the actual number of deaths by the light line.

The better to appeal to the mind than mere numbers would do, the statistics of each disease dealt with have been put down in Chart form.

The rise and fall of the lines may be likened to the rise and fall of waves—the big, huge, high waves represent storms of disease, while the small ones below represent calms.

The ascending line indicates the onset of a storm; the top, the height to which it attains; and the descending line, its decline.

On the Charts, especially those depicting infectious diseases, will be noticed storm after storm; by observing the markings, therefore, it is easy to tell from the height, whether the Epidemic was severe, from the breadth, the time it lasted, and glancing along the Chart, it is easy to compare any particular storm or Epidemic with those that have gone before, or with those that come after.

For each disease there are yearly Charts and monthly ones. The yearly show best the increase or decrease in the death-rate; the monthly give the details, point out when the Epidemics begin, their course, their character, and their favourite season of the year.

The order in which it is proposed to deal with the subject is the following:—

First.—Those diseases will be pointed out which affect the death-rate more than other diseases, and the way in which they have behaved during the period between 1858-1881.

Second.—The total death-rate from all causes will be considered.

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Third.—The changes that have gone on during that time which may have influenced the total death-rate.

Fourth.—The effect of similar changes in other towns.

Fifth.—Some general statements in reference to the facts elicited.

The diseases which affect the death-rate to a considerable extent are the Seven Zymotics, Phthisis and Bronchitis. The other diseases, except perhaps Heart Disease and Cancer, are pretty uniform in all places similarly situated.

Beginning with SCARLET FEVER, the Chart indicates a number of storms gradually decreasing in severity.

In 1860, Scarlatina caused 300 deaths, or per 100,000 of the population, 407—these deaths were the crowning point of an Epidemic that began in 1859, and ended towards the close of 1861, or rather the beginning of 1862.

This Epidemic alone swept away over 500 persons.

There is a lull for a time (better seen in the monthly Chart), and then the disease again appears—spreads itself over another three years—it does not reach so high in 1865 as in 1860, yet over 350 persons perished; in 1868 there is an inclination to become active, but from some cause this activity soon ceases; in 1870 another Epidemic begins, lasts five years, and during that time destroys 400 lives; in 1877 and 1878 there is another Epidemic, but, compared with the three pointed out before, it is insignificant.

The first Epidemic of Scarlet Fever marked here really dates back to the end of 1858, when, and for several months previously, there had been no deaths from this disease. A few, however, occur at the end of the year, and during the first 8 months of 1859, the deaths never going beyond 2 or 3 each month; but in September and October of 1859 the Epidemic breaks out with much fatality, killing between 15 and 25 each month. This continues for a whole year, until September of 1860, when the disease gains a fresh accession of strength, and then reaches its highest severity, cutting off on an average between 40 and 50 each month, during September, October, November, December, and January.

In February, 1861, the deaths again decline to what they were before the great rise, and, fluctuating for some months, gradually decrease. All the other Epidemics of Scarlet Fever conduct themselves much in the same way, as is seen by the uniformity of the Chart.

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These Epidemics of Scarlet Fever seem to spread over periods of 5 years—each divided into 2 parts—

(1.) A period of duration or activity.

(2.) A period of rest.

The period of activity lasts about $2\frac{1}{2}$ years.

The period of rest about $2\frac{1}{2}$ years.

The Epidemic beginning in 1870 appears to be two Epidemics run into one—it lasted 5 years without any interval of rest. The time of greatest virulence, or the favourable season of the year is the cold season, viz. :—October, November, December, January and February, and it is a point worth noticing, that in 1860, when the temperature in Aberdeen was lower than it has been ever since, Scarlet Fever was very fatal, and the largest Epidemic of the 24 years was then.

Let us now compare the first 12 years from 1858 to 1869 with the second 12 years from 1870 to 1881. There was a yearly average in the first 12 years of 102 deaths per 100,000, whilst in the second 12 years there are only 50 deaths annually per 100,000.

There has, therefore, been, on an average, a decrease in the last twelve years, compared with the first twelve, of 50 per cent.

This is shown remarkably well in the Chart; it appeals to the eye in a most striking manner. Either Scarlet Fever has become very much less fatal within recent years, or the number of cases are much fewer—old doctors in Aberdeen rather favour the first view. They say the type of the disease appears to have changed—the severe sore throats and excessive shock from the poison, which formerly characterized the disease, have gone. But if less fatal, why? My own experience has always been, that if children have mild attacks of Scarlet Fever, it is chiefly owing to fair sanitary surroundings. I have invariably found that those children attacked with Scarlet Fever who have been exposed to the foul emanation of drains, or putrid matter of any kind, always have very severe sore throats, and in most instances die from it. My conviction is very strong on this point, for, during enquiries particularly referring to this, I have constantly found that the fatal cases have been among people where some bad influence from filth has been working along with the Scarlet Fever. This explains, in my opinion, the virulence of Scarlet Fever 20 years ago, and its general decline in severity during the last ten years. Since 1870, Aberdeen has been becoming a cleaner town. I shall show how, further on.

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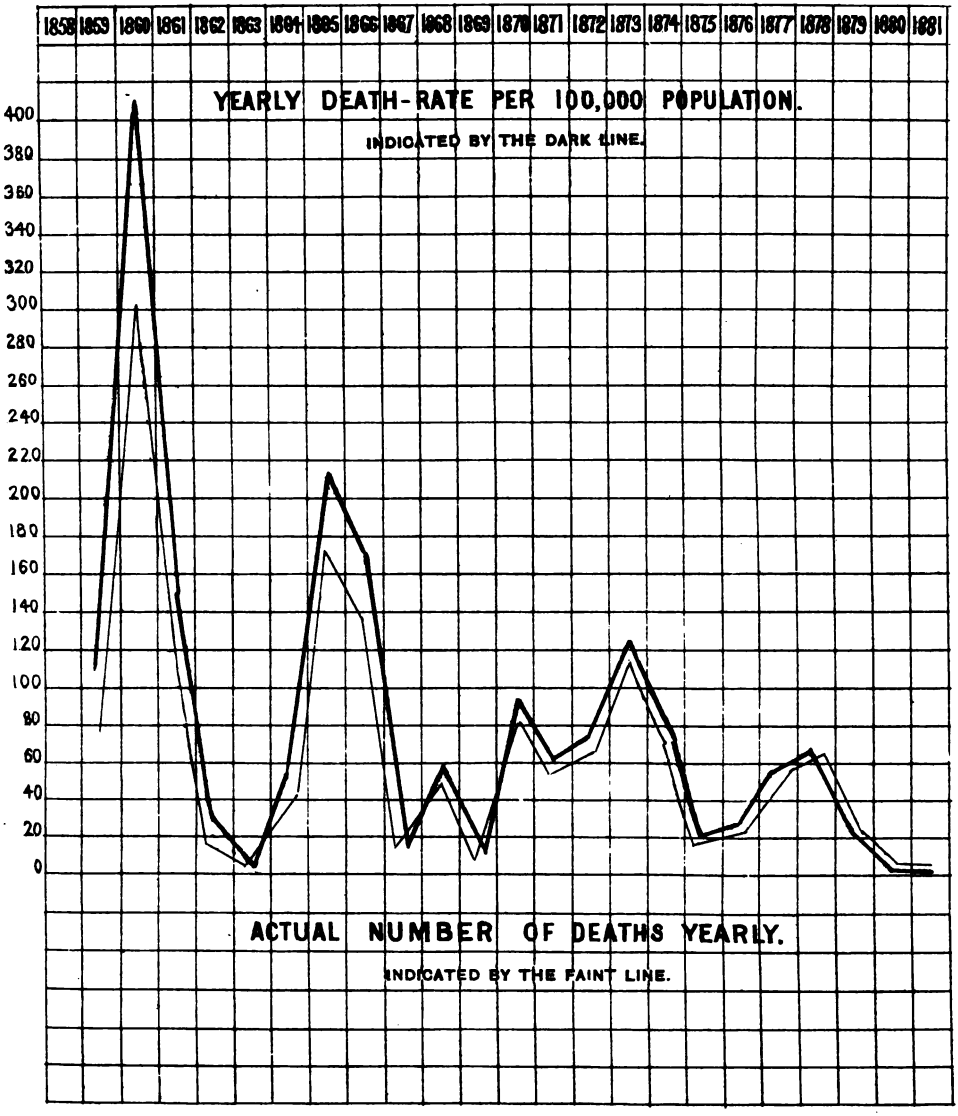
SCARLET FEVER.



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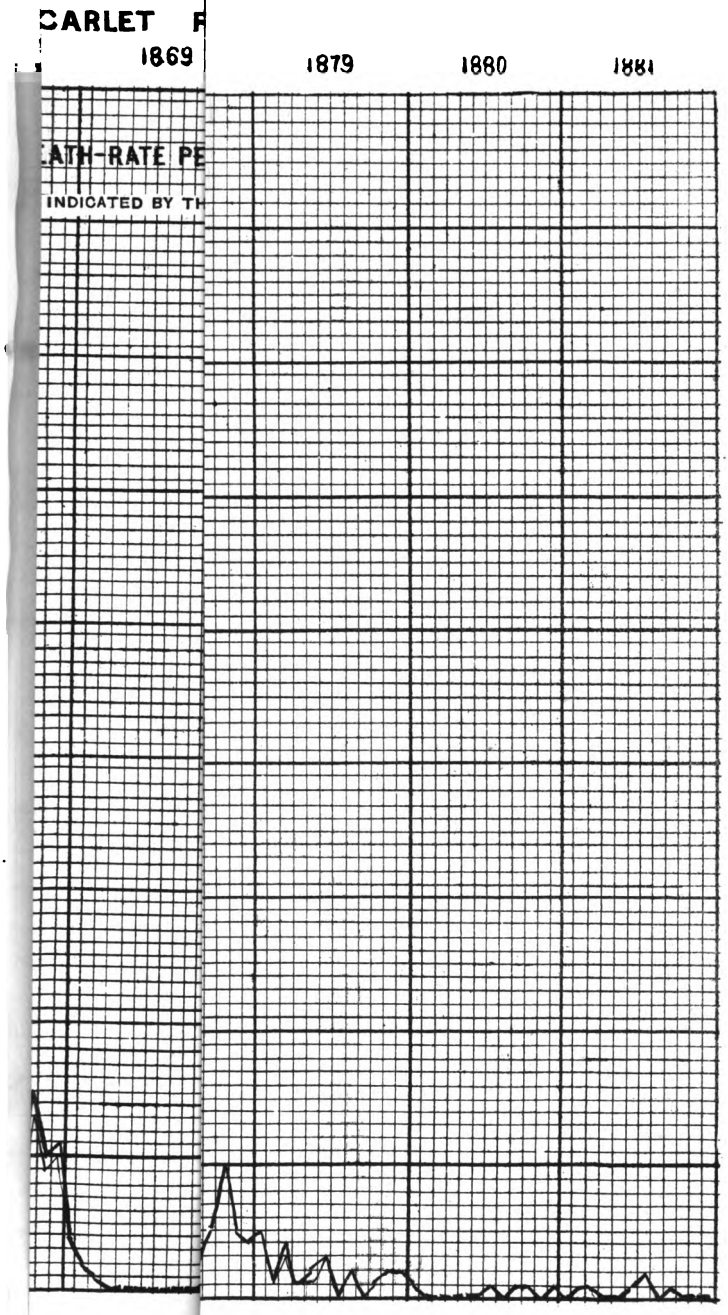

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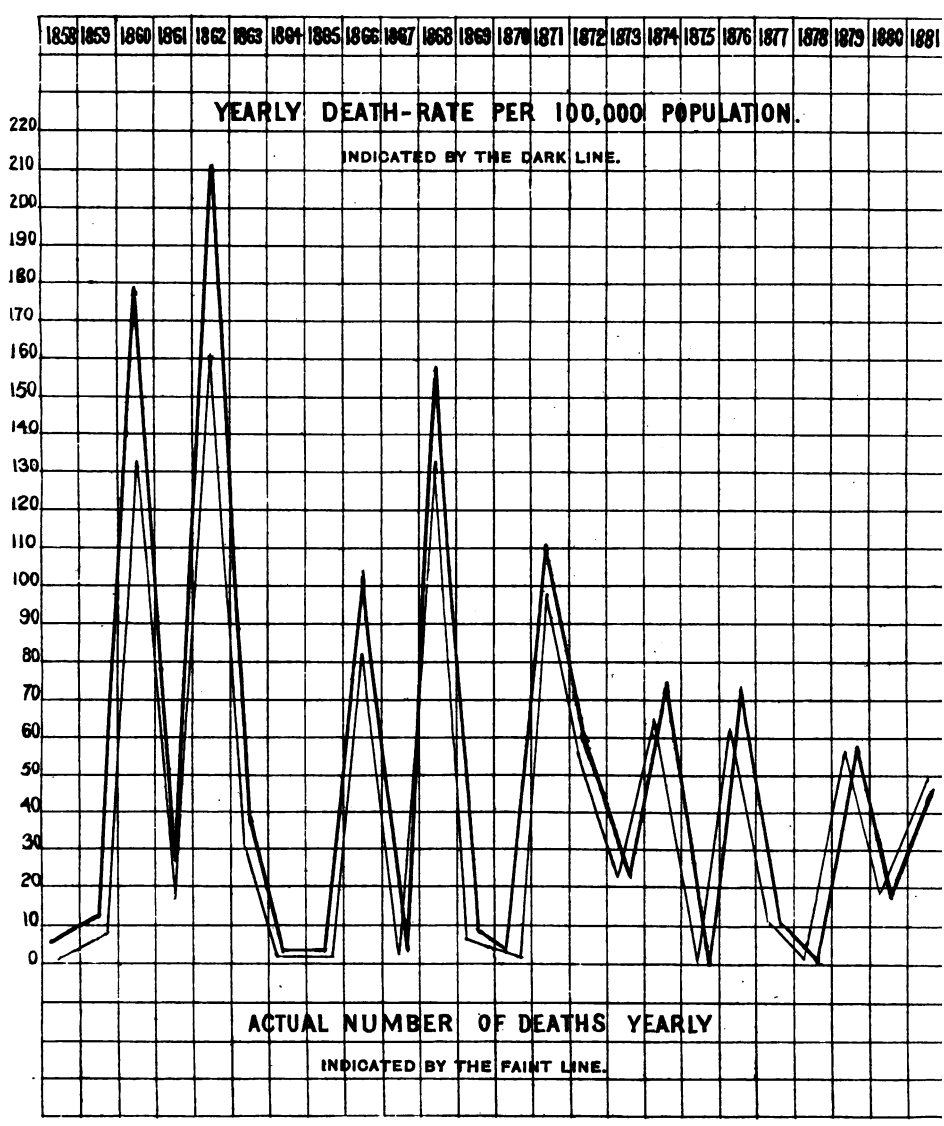

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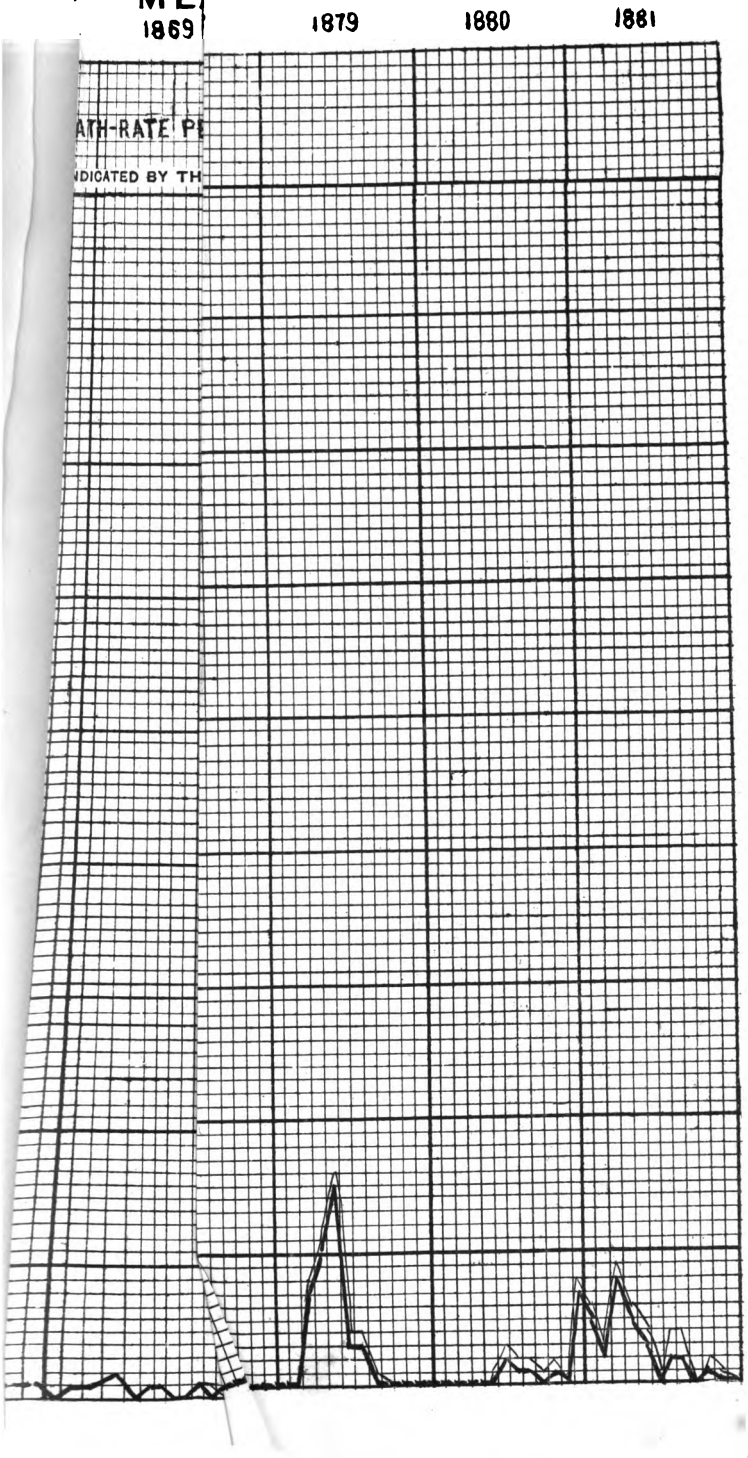

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MEASLES.—Turning from Scarlet Fever to Measles, a very different Chart is delineated.

In Measles, the ascent is quick, and the decline is as rapid. It does not spread over several years. One year the deaths from Measles are numerous, the next year there are no deaths at all, or at most, very few.

The larger number of deaths occur close together, within two or three months—in this monthly Chart they rise like so many spear-heads. It was desirable to see whether Measles acted in the same way in other towns. This is the Chart of Dundee since 1859—it presents a precisely similar character.*

Measles commits great ravages. There are three very large Epidemics, besides other smaller ones. Each of the Three Epidemics causes as many, even more deaths than the very largest Epidemic of Smallpox.

In the first Epidemic shown, 141 die; 2 years later, 190; 3 years after, 83; 2 years after this, 134; 3 years after, 154; and then 2 years after, 90. Since then there have been some lesser Epidemics.

The interval between the presence and absence of Measles varies between 2 and 3 years—better shown in the monthly Chart—so that the non-activity or period of rest of Measles lasts about the same time as Scarlet Fever, viz.:—between two and three years. The difference is in their length of duration or activity, Scarlet Fever lasting about two and a-half years—Measles, at the most, only six months.

The common belief is that Measles is not a fatal disorder—a glance at the Chart tells a different tale. Every two or three years it claims a large number of victims. Of late years there has been a decrease in the mortality, probably in a measure, not wholly, however, to the fact that teachers, as a rule, are becoming more alive to their interests than to allow a child suffering from Measles to return to school too soon. That schools are the great cause of the spread of Measles is evident from the rapid fall in the number of cases when a school has been shut up because of Measles being amongst the pupils.

* Chart referred to has been omitted.

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Smallpox has not shown the same tendency to decline either in severity or in frequency.

Of it, there have been four Epidemics, the largest in 1872.

Whenever an Epidemic is in England, or even on the Continent, Aberdeen, sooner or later, is almost certain to have its share. The contagion may be brought either by land or by water.

In 1871, England was suffering from Smallpox brought over by the refugees of the Franco-Prussian War. It travelled northward, arriving in Aberdeen in 1872, and did not stop its ravages in the town until 132 persons had died.

There is no disease which can be more easily prevented. Vaccination stops it at once. Anti-Vaccinators lay much stress on Smallpox Epidemics occurring amongst a well vaccinated nation. If the nation were well vaccinated, as they assume, there would be force in the argument; but the assumption cannot be granted. Close scrutiny into the figures shows that it is not the thoroughly vaccinated who suffer (by thorough is meant the presence of four or five good vaccine marks), but the large number of unvaccinated, plus those where the operation has been improperly done. Public Vaccinators know too well that one or even two marks often rise in children that have had vaccine put into their arms, which afford no real protection from Smallpox. These marks are readily discernible, both at the time and at an after date, hence the importance of letting the vaccinator see the vaccine marks eight days after the operation. Instead of this, the mother frequently takes it upon herself to judge whether it is a good vaccine vesicle or not. Hence the disastrous results.

Again, experience has only now taught us that at about 14 or 15 years of age, when the whole body changes in a remarkable degree, the influence of the vaccine put into the body during infancy is lost, or at least has greatly lost its beneficial power.

Re-vaccination is not a common practice.

The Fevers include Typhoid and Typhus Fever. Typhoid and Typhus Fever have not been separated in Statistics a sufficiently long time to give any reliable data when dealt with individually. Till 1868 they went under the common name of Typhus. There had been many disputes about these two distinct diseases. Some maintained that the differences indicated only varieties of one disease; others, that they were

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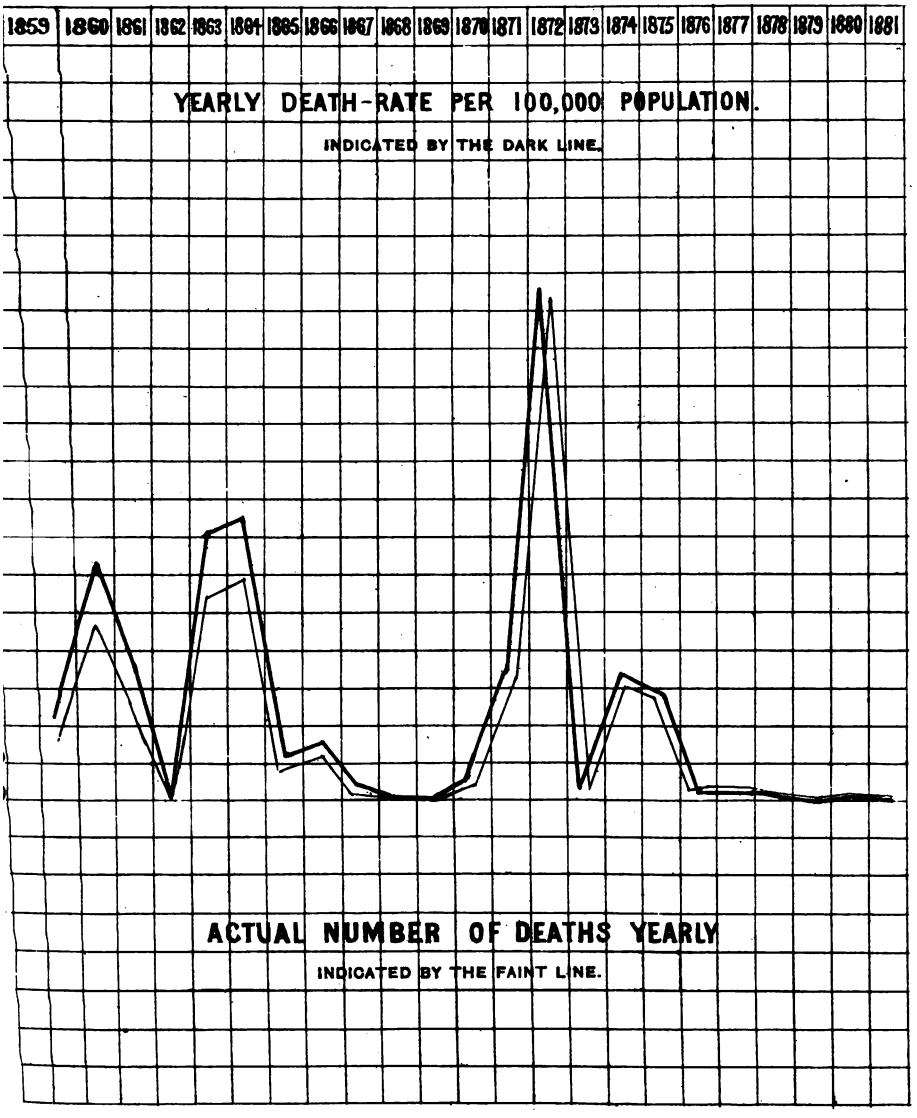
SMALL POX.


1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881
YEARLY DEATH-RATE PER 100,000 POPULATION.
INDICATED BY THE DARK LINE.
ACTUAL NUMBER OF DEATHS YEARLY
INDICATED BY THE FAINT LINE.

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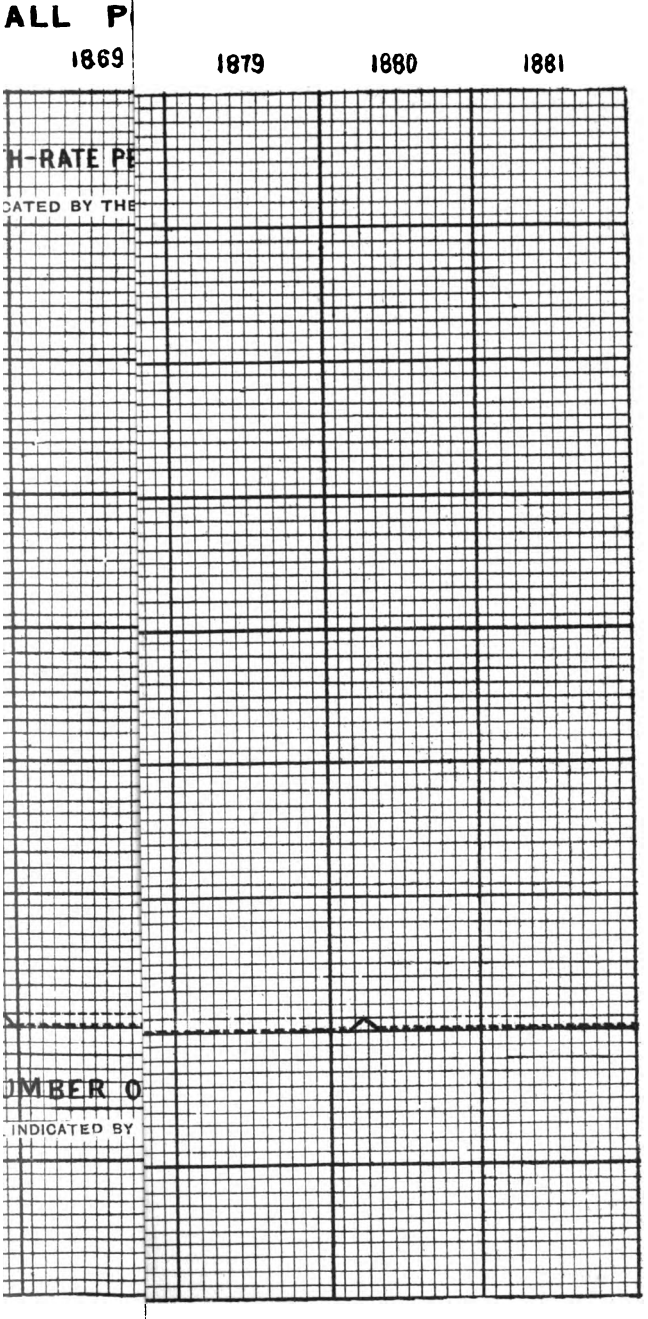

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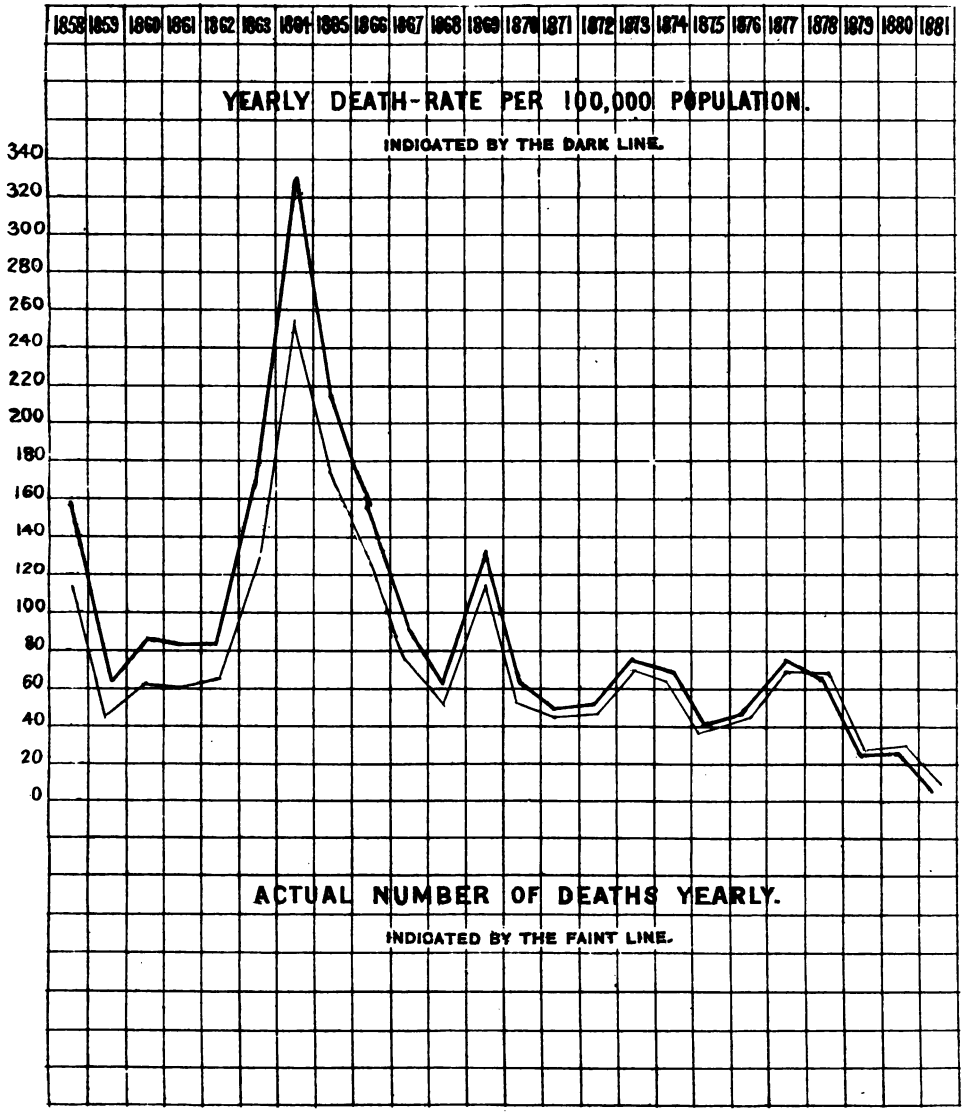
THE FEVERS.



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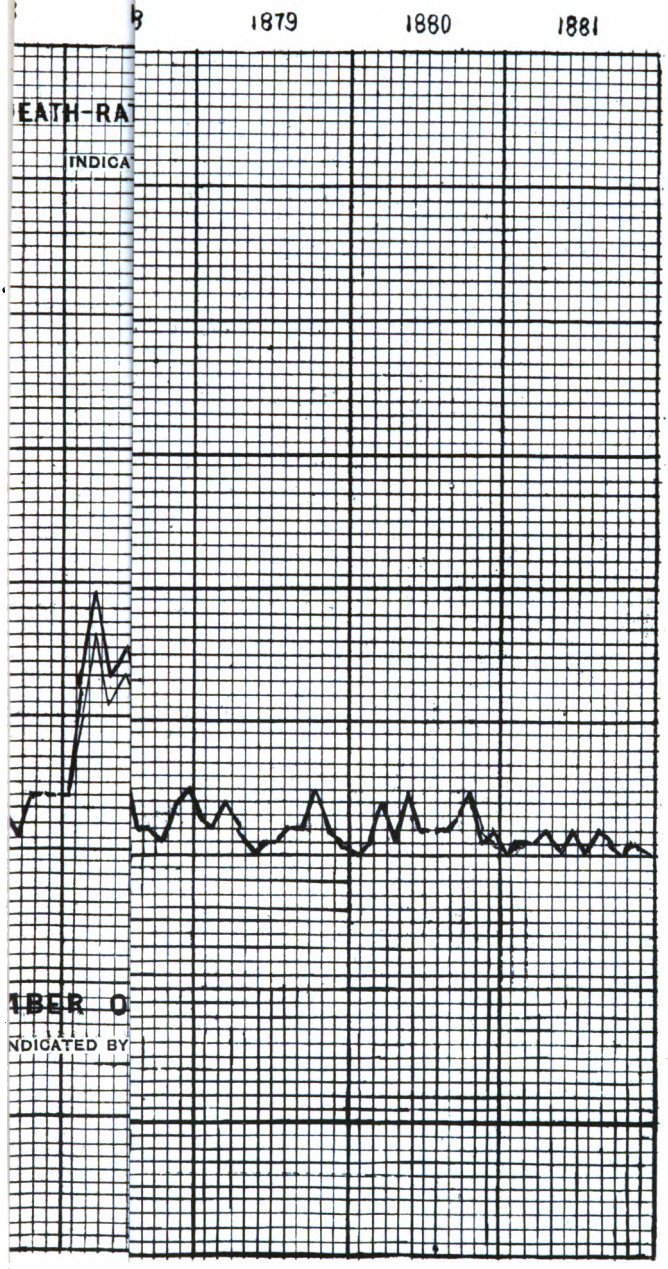

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not varieties, but two distinct diseases, each having a history of its own, and produced by altogether different causes. No definite conclusions had been arrived at to justify a separate registration until 1868. It may be as well to mention here that Typhoid Fever is no new disease, and has not been brought recently into existence by drains. It is an old foe under a new name.

The Chart is a well marked one, and most conspicuous is the height to which the storm attains in 1863, '64, '65, and '66—in these four years some 700 persons died of fever. If we estimate one death in every six cases, for in every Epidemic the majority of the people attacked recover, we shall have over 4,000 people attacked with fever during that period—in other words, an average of 1,000 a year.

This was at a time when the population was about 20,000 less than it is now.

The state of matters at that time may be illustrated by an old woman's remark to me the other day. On making enquiries in one of the Gallowgate Courts into the recent outbreak of Typhus Fever in the town, I was accosted by an old woman wanting to know what it was all about, for she well remembered when nearly all in the Court were down with Typhus Fever and Cholera, and there was not half the fuss made. "Gin the folk maun tak it, they maun tak it, and there's nae ese a'ee tribblin yersel aboot it." It was through acting on a policy like this that in the years 1864, 1865, and 1866, the people of Aberdeen suffered so terribly, both from Fever and Cholera.

In 1869, a smaller Epidemic of Fever prevailed, and since that date there has been a general decline down to 1881, which registers the lowest number in the 24 years. From 1858 to 1869 inclusive, *i.e.*, during the first 12 years there were 1,277 deaths from Fever. Again, from 1870 to 1881 inclusive, the second 12 years, there were only 582 deaths from Fever.

These are actual numbers, and do not take into account the increased population of the last 12 years; if this is taken into account, there has been a decrease in the second twelve years compared with the first of 63·2 per cent.

The dark line shows the great and steady decline.

In fact, the most striking alteration in all the Charts is in the Fevers. The change is something marvellous.

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Whooping Cough.—There is nothing particular to observe about Whooping Cough, unless it be its uniformity through the whole period.

Its Chart has a great resemblance to those of Measles, Bronchitis, and other Chest affections, in its rise one year and fall the next—it can scarcely be said to be Epidemic, it might with more reason be said to be Endemic. No sanitary measures, so far, have had any effect upon it. It is neither increasing nor decreasing. Its average during the 24 years would not be represented by a curve, but by almost a straight line.

The year in which there were the fewest deaths was 1865, when there were only 5 deaths. The reason of this I have not been able to make out. The Endemicity of Whooping Cough and its cause are worthy of minute investigation, for it is most destructive to infantile life. In Scotland for years back it has ranked high among the causes of death in children.

Diphtheria is a companion of the other Zymotics—when they are present to any considerable extent, it is also present.

There is an Epidemic in 1864, when Fever and Scarlet Fever prevail. Another in 1872 when Smallpox is present. The mortality from it is again high in 1877, 1878 and 1879.

Diphtheria is not a very common disease in Aberdeen. It is rather a country than a town disease. The stinking middens, undrained land, and filthy surroundings of farms are the favouring conditions and soil for the germ of the disease, which is believed to be a minute microscopical living animal, which grows, propagates, and becomes virulently active. It may, however, be sent into town in the milk; and once a centre has been set up, it may spread rapidly by contagion, and in other ways.

Phthisis or Consumption forms an eighth part of the total deaths.

The Chart shows a surprisingly Epidemic character; from 1858 to 1870 the fluctuations are as great as any of the contagious diseases.

It is gradually becoming more strongly a conviction in the minds of the members of the medical profession that Phthisis is infectious. It has always been considered so in some countries, especially in Italy. It is therefore not startling to find the Statistics of Aberdeen seemingly strengthening this idea. It is now well ascertained that formerly too much stress was put on the hereditary influences of Phthisis. Phthisis from its common prevalence had, in a way, got

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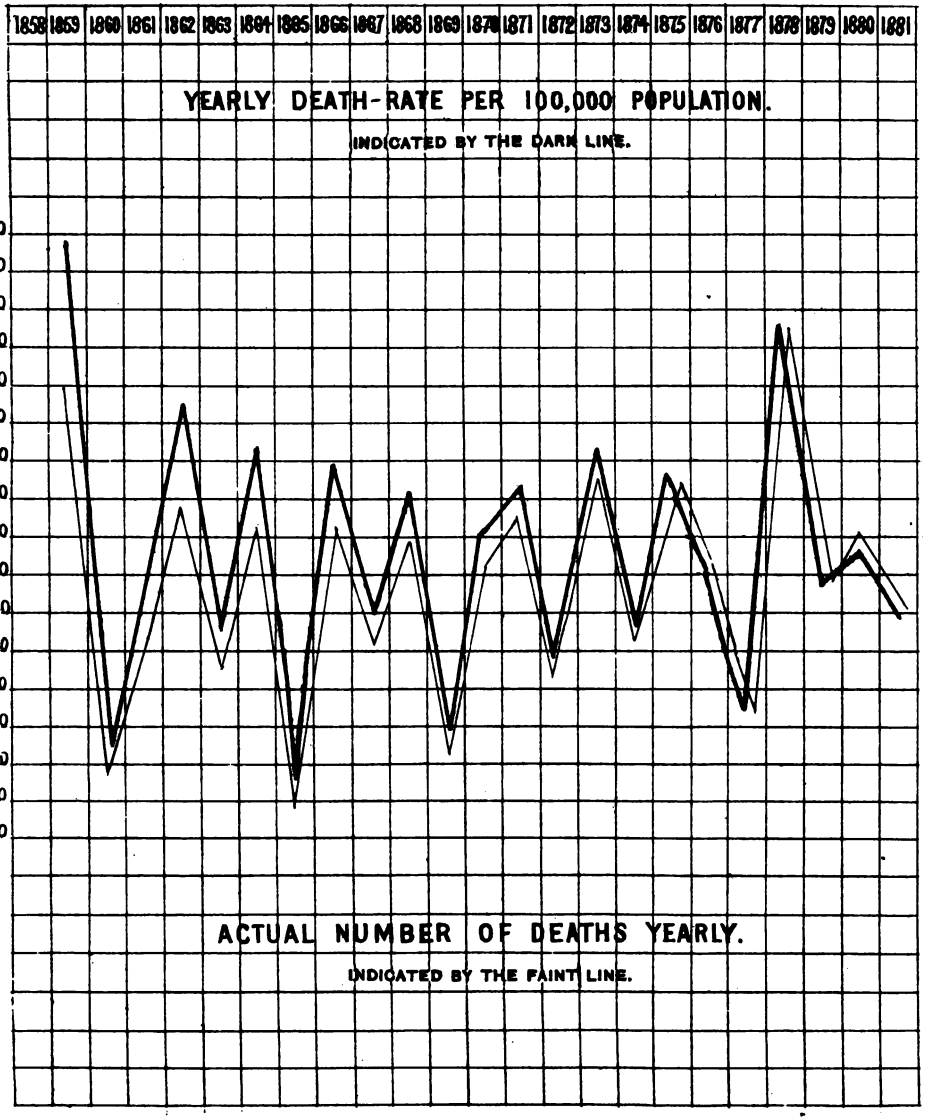
HOOPING COUGH.



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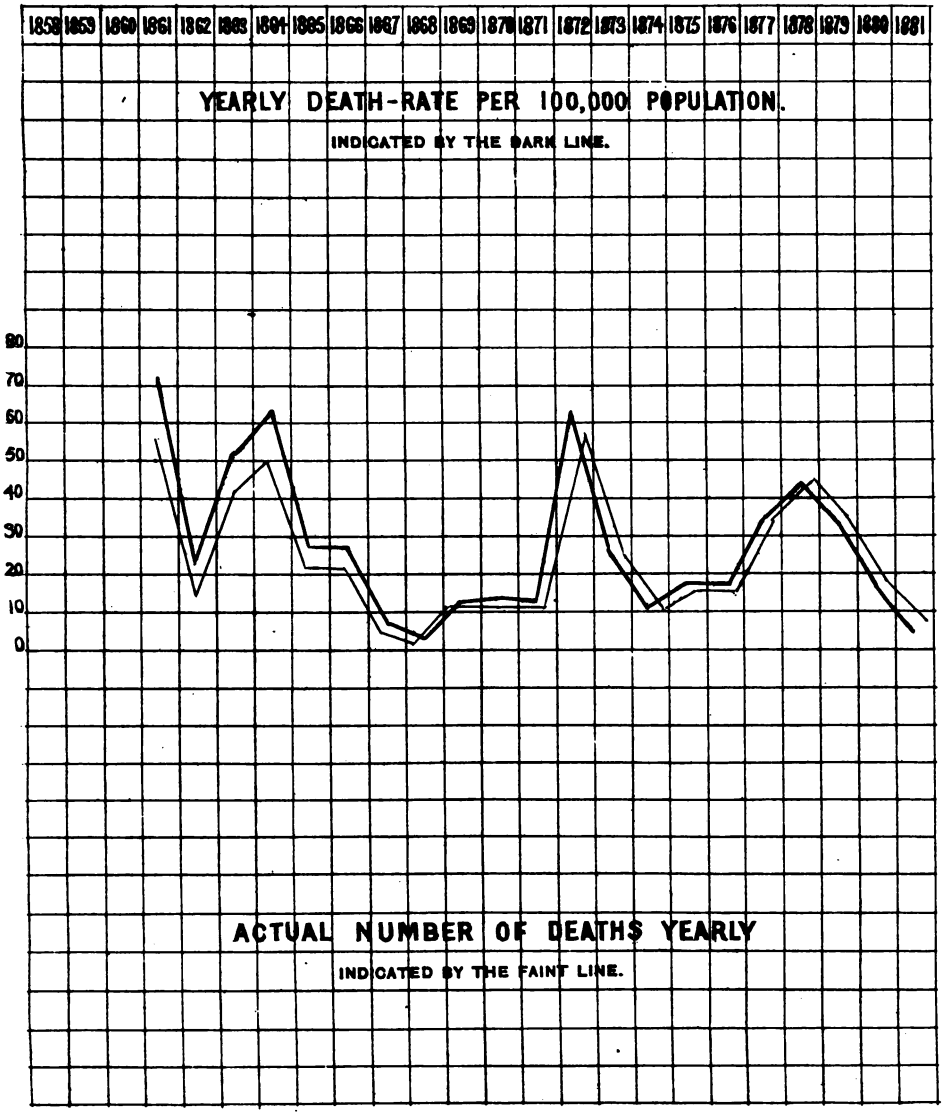
DIPHTHERIA.



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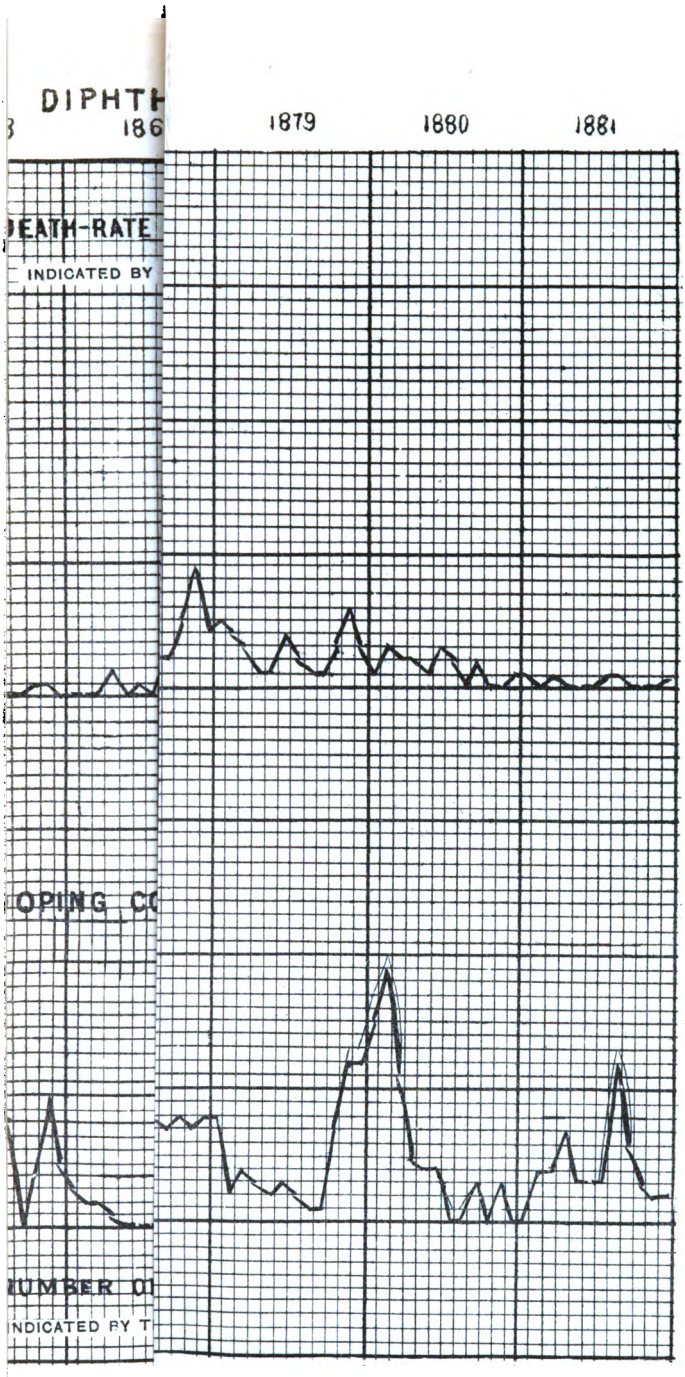

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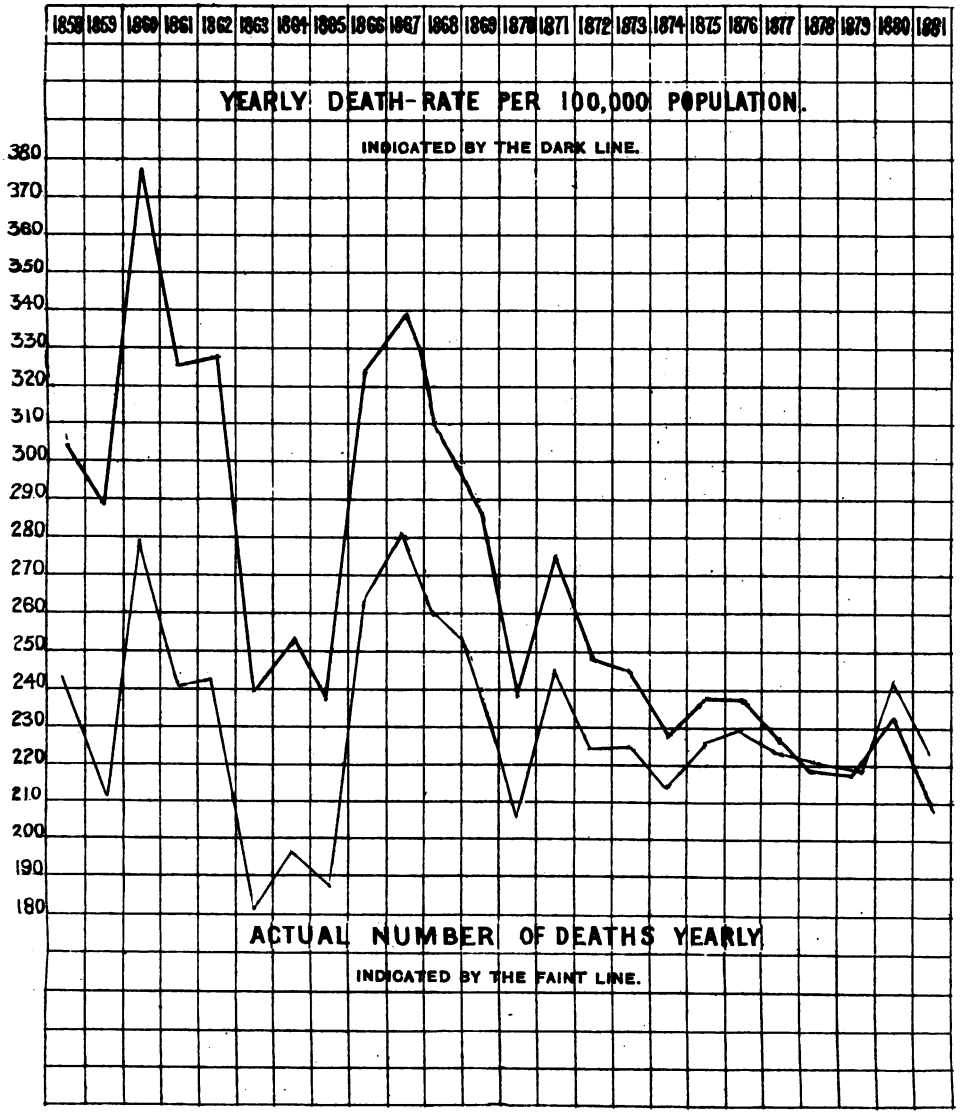

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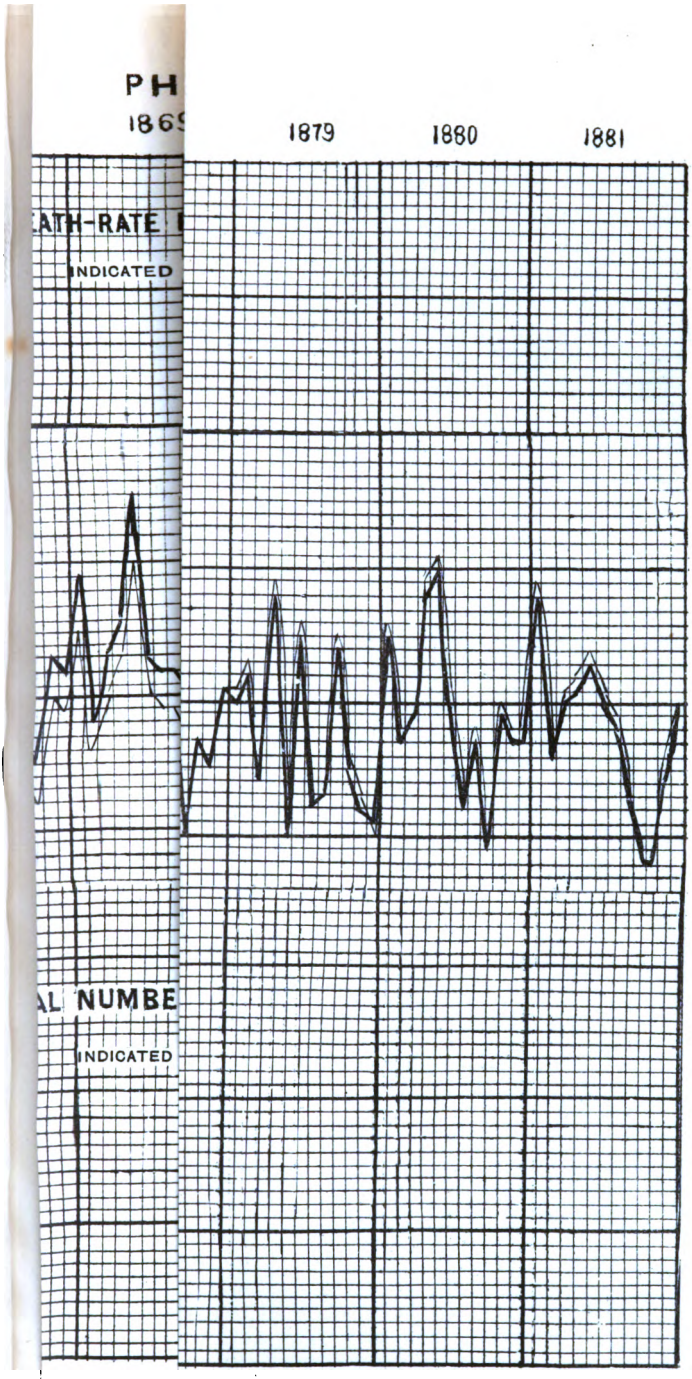

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credited with being hereditary. Sanitary investigations in the army, navy, and amongst the civil population have led to other conclusions, and have proved for the most part that inheritance is a delusion.

There are undoubtedly in some people a strong constitutional predisposition to take Consumption, just as there is in some people a strong constitutional tendency to take Smallpox, Scarlet Fever, or any other Zymotic disease on the slightest exposure to poison, when others, much more exposed, escape. Further than this constitutional inheritance there is none, unless an inheritance of habit is admitted. The habits of the parents who kept the rooms unventilated, and were well satisfied to live in a damp and unhealthy dwelling, produced in them Phthisis. The same habits and mode of life have led the offspring to the same goal. Consumption ran, and still runs in families, but these families lived or live under the same conditions of life. They breathed the same impure air, and were subjected to the same damp soil, and the same want of out-door exercise. Change the mode of life sufficiently soon, and Consumption will disappear. To sum up, the greater portion of consumptives are victims of bad air, damp dwellings, unhealthy occupations and workshops, or the nursing of a consumptive patient.

But to return to our subject, the Epidemic appearance of the Chart may be merely a coincidence. The great decrease in deaths from Phthisis during the years 1863, 1864, 1865, might be attributed to the excessive number of persons at the consumptive age dying of Fevers; for we may suppose many that would have died of Consumption were just fit subjects for the other.

Whichever supposition is right, and even if both are wrong, it does not affect the result, viz.:—that Phthisis was high in its death-rate up to 1869; since which time it has been getting lower and lower—last year, 1881, giving the lowest number in the 25 years.

It is exceedingly interesting to find, that from 1858 to 1869, a period of 12 years, there are a larger number of deaths than from 1870 to 1881, when the population was much greater. The average yearly number of deaths per 100,000 for the first 12 years is 302; for the second 12 years 233; showing a decrease during the latter period, as compared with the former, of 22·80 per cent.

March, April, and May, are the months most fatal to Consumptives in Aberdeen. During these months the east winds are particularly severe. It is not, however, the east winds that cause Consumption, but they bring it speedily to a fatal issue.

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Bronchitis.—If it is a matter of congratulation that Phthisis has decreased, it is not so in regard to Bronchitis. The Chart of Bronchitis is a great contrast to that of Phthisis.

The death-rate of Phthisis is high before 1869, after which it gradually but very steadily declines.

Bronchitis, on the other hand, is low before 1869, and then not gradually, but very suddenly, mounts up until comparing the lowest number, which was in 1858, with the highest, which was in 1875, there is a difference of 195 in the respective years, or, comparing the first 12 years with the second 12 years, there has been an increase of Bronchitis to the extent of 37 per cent.

It might seem that the one had taken the other's place, and what had been called Consumption or Phthisis before, was now called Bronchitis. This was the first idea that suggested itself to my mind. On further analysis, this view was not confirmed, and had to be abandoned.

1. The apex of Bronchitis is in the late and early part of the year, whilst Consumption has usually its worst month about May.

2. The vast majority of Consumptives die between the ages of 5 and 60; in reality, in a far more contracted period, the chief work is done between the ages of 15 and 35.

The vast majority of Bronchitics die first under 5 years of age, and then again over 60 years of age. I have compared the ages of all those who have died from Consumption and Bronchitis since registration in 1855. The two facts brought out are—

(1.) The persons that have died from Phthisis between the ages of 5 and 60 are, since 1869, many fewer in number than before that time.

(2.) Bronchitis is carrying off a much larger number of children under 5 years of age since 1869 (proportionately) than before.

Bronchitis does its chief work below 5 years of age, bears lightly on the period between 5 and 60, and then comes heavily down after 60.

The cause of this increasing excessive infantile mortality is difficult to discover, but I am induced to believe that it may be aided by the greater number of women employed in factories who have children, and who are, from being out all day, unable to take care of them. When they come home, they take them out and expose them to the night air.

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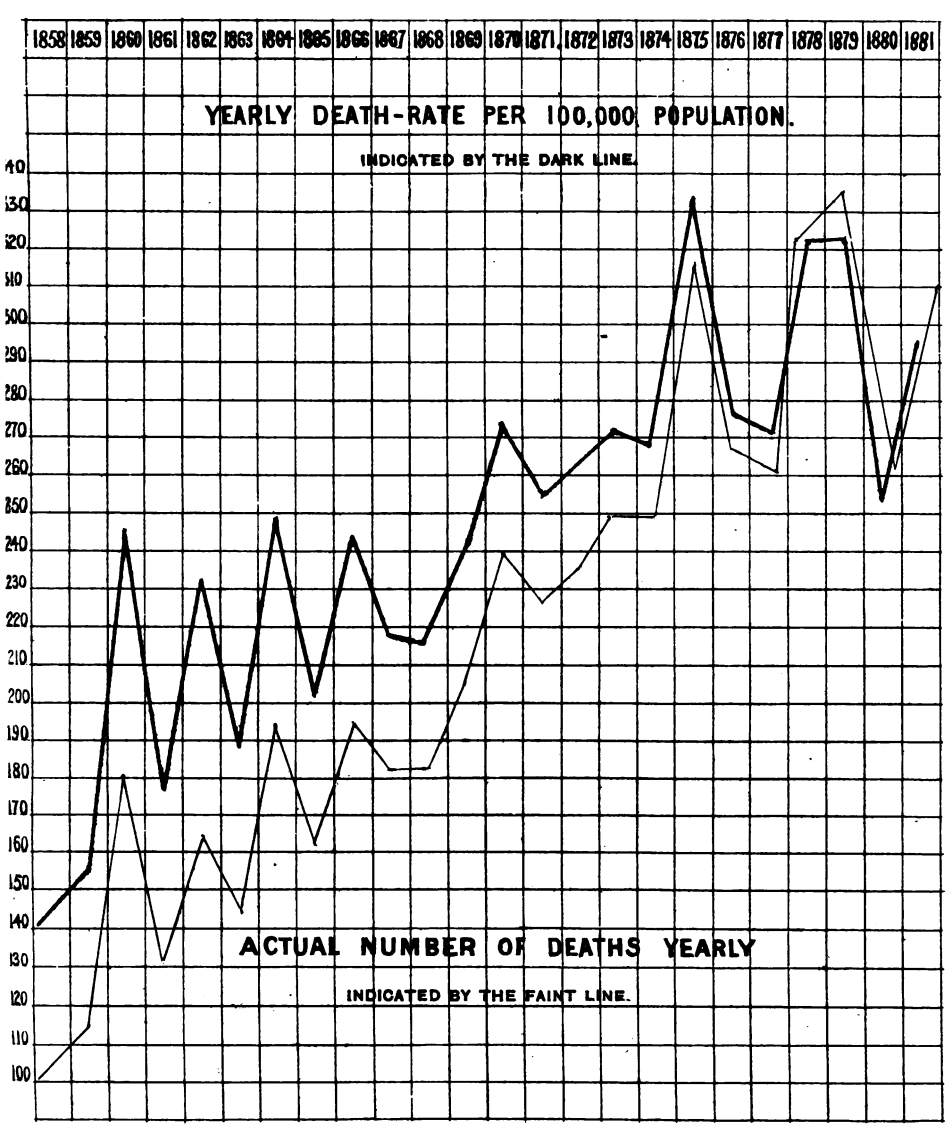

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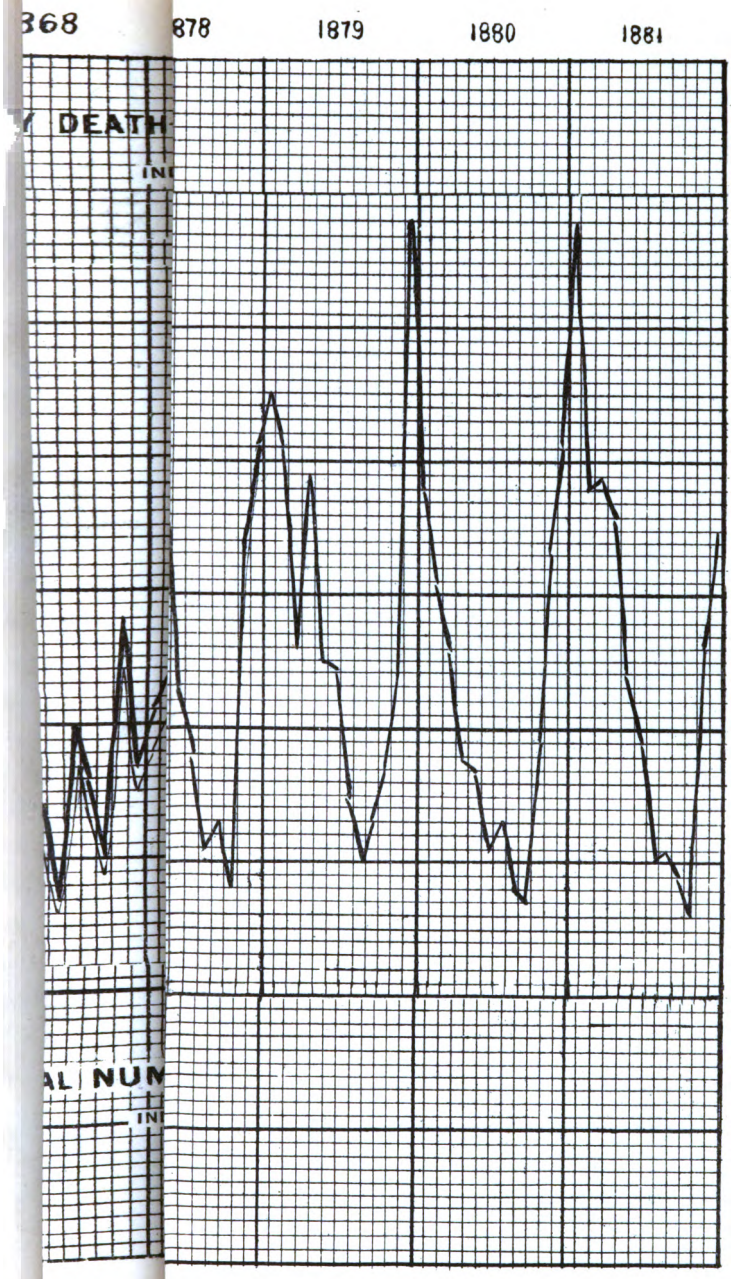

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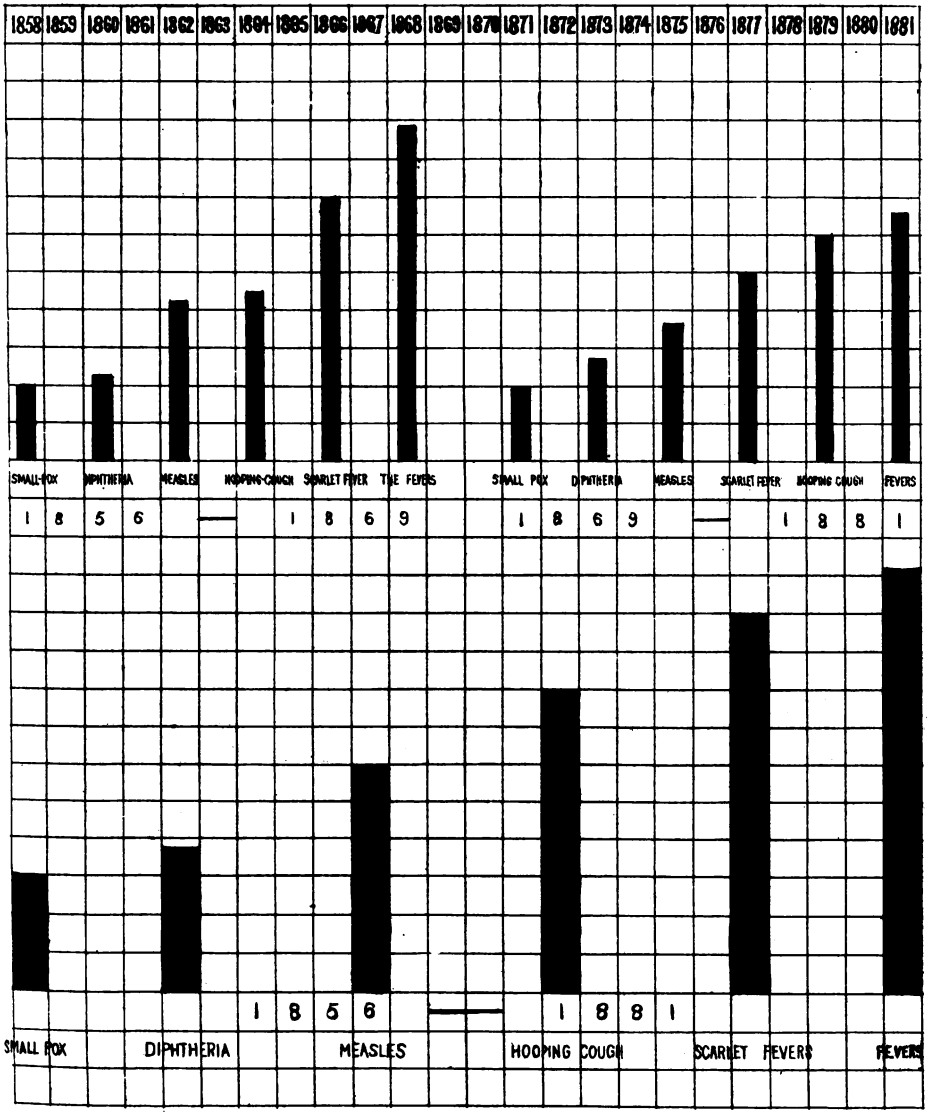
RELATIVE MORTALITY OF ZYMOTICS.



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Bronchitis in children is quite preventable. They cannot catch colds unless exposed to draughts, or to the cold air, when improperly clothed. They do not expose themselves—it is their mothers, or those who have charge of them. A ridiculous practice is the attempt to "harden a baby"—the process of hardening sends it to the grave. A child more easily takes cold than an adult. What would be the verdict if a woman went out with a low dress and short sleeves in a bitterly cold wind? Probably it would be that she had no sense, and that if she caught a cold it would be her own fault. Then it may be asked—How is it that tender infants under 5 years of age are clothed in such a senseless way, and exposed in such a reckless manner?

Relative Mortality of Zymotics.—The diseases which affect most largely the total death-rate from all causes have been now gone over, but before going on to consider the total death-rate from all causes, perhaps it would be as well to point out the Relative Mortality of the Zymotics.

On this Chart they are placed in the order of their fatality, viz.:—Smallpox, Diphtheria, Cholera, Measles, Whooping Cough, Scarlet Fever, Fevers.

It comes out, as a peculiar fact, that the most dreaded diseases are the least fatal, and the least dreaded diseases are the most fatal—I presume, because more precautions are attempted.

Measles, Whooping Cough, and Scarlatina are the most serious, although it is usually considered they do little harm. Of all the more common infectious diseases, Smallpox has actually caused the least number of deaths, as is seen from the Charts, while Measles has caused in the same period twice as many deaths, Whooping Cough nearly 3 times, Scarlet Fever nearly 4 times, and the combined strength of these diseases, 9 times.

Like Phthisis, their very frequency make them less dreaded. People become accustomed to the death-roll around them and think little of it. The disease that comes unexpectedly, and passes over quickly, is looked upon with greater feelings of terror than the disease which may be more fatal, but more common.

Taking the whole period, from 1855 to 1881, the Zymotics take the following order, beginning with those which have caused the least number of deaths, Smallpox, Diphtheria, Measles, Whooping Cough, Scarlet Fever, the Fevers. Dividing the 26 years into two periods, the first 13 years show the same order, the second 13 years do not—there is a difference not only in proportion, but also in the order.

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Whooping Cough, fourth on the list in the first, has mounted up to the sixth place, leaving even Scarlatina and Fevers behind. It has the unenviable distinction of having caused in these 13 years more deaths than any of the other Six Zymotics, not that it has actually increased in severity, but it has gained its place by the decrease of the others.

TOTAL DEATHS AND DEATH-RATE FROM ALL CAUSES.—As there are great fluctuations among the diseases which mostly affect the Total Death-rate, we may naturally expect to find the Total Death-rate also fluctuating as a whole. The Chart shows plainly that it does.

The average death-rate up to 1868 is high, remarkably so; after 1868 it is low, especially during the last three years. The average yearly death-rate of the first twelve years is 2,450 per 100,000; for the second twelve years it is only 2,150, so that on an average in the latter period there has been a decrease in the death-rate of 12·25 per cent.

The great fluctuations correspond to the presence or absence of Epidemics. In 1860, the diseases that raise the death-rate so high are Scarlatina, Measles, and Phthisis; in 1862, Measles; in 1864, Fevers and Diphtheria; in 1866, Scarlatina, Cholera, Fever, and Phthisis; in 1868, Measles; in 1872, Smallpox and Diphtheria; in 1878, Whooping Cough, Scarlet Fever and Diphtheria.

The great loss of life in the earlier years of the period may be illustrated by comparing the actual number of deaths in 1860 with those in 1881:—

in 1860 there were 2,191;
in 1881 there were 2,052;

that is when the population was less by some 30,000 than it is now, there were in one year 139 more deaths.

The scale will perhaps bring it out more strongly—

In 1860 Aberdeen lost at the rate of nearly 3,000 per 100,000, or 3 per cent. In 1881 it lost at the rate of nearly 1,900 per 100,000, or 1·9 per cent,—a difference of rate of 1,000 lives per annum between the two years.

The difference between an annual rate of 29 per 1,000 and 20 per 1,000 is not startling to those unacquainted with its true meaning—it requires to be stated in another form.

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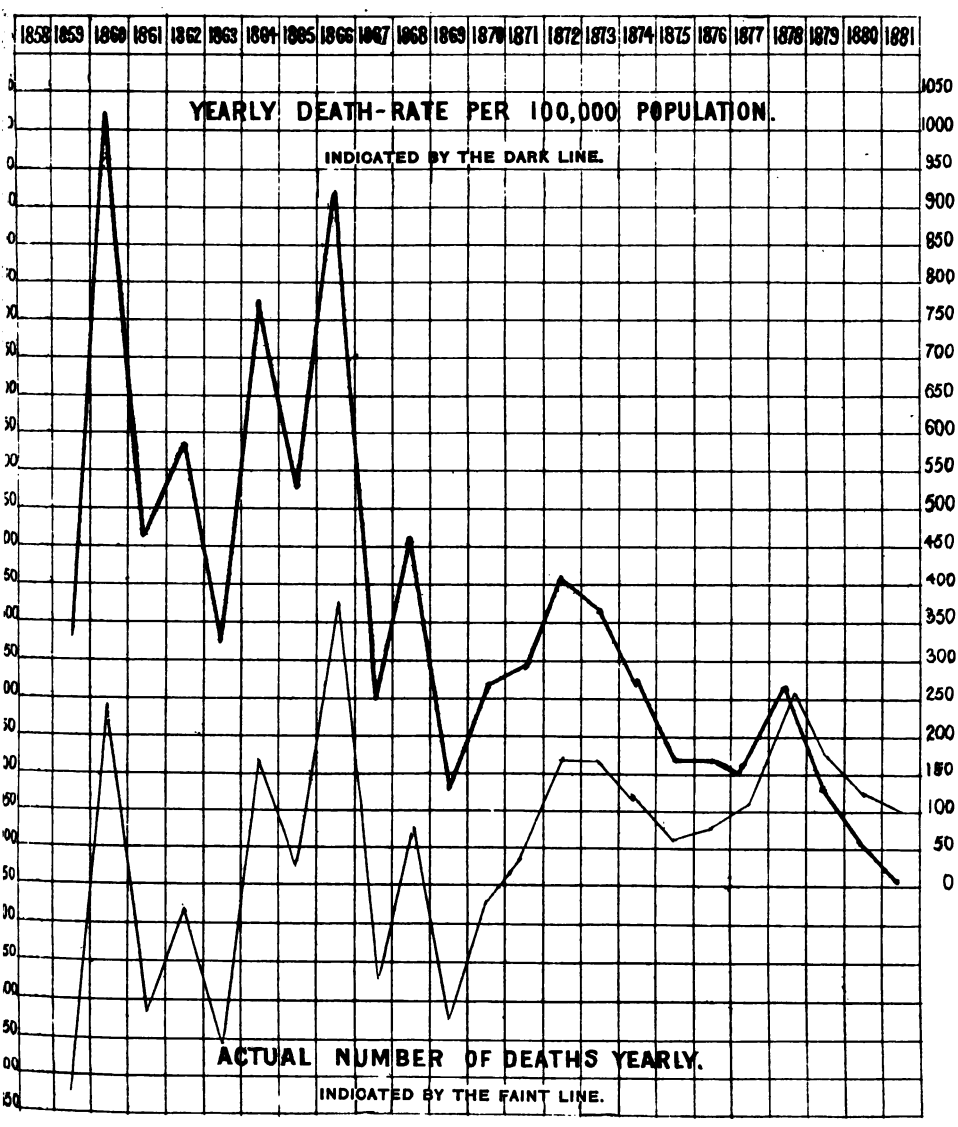

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If Aberdeen had the same death-rate in 1881 as it had in 1860, it would have lost over 1000 more inhabitants last year than it actually did. But 1860 was an exceptionally fatal year, and it is scarcely fair to take these and compare them—let us take 1861, which is very much lower. Still here, in 1881, there is a saving of more than 450 lives, viz. :—

in 1862.....600 lives,
in 1863..... .....300 „
in 1864.....800 „
in 1865.....500 „
in 1866.....900 „

and so on.

To those who ask how did people get on before such attention to health matters was given as we are beginning to give, my reply is, they did not get on, but they got off, and surprisingly fast.

It would be interesting to speculate as to the number of lives that might have been saved in Aberdeen, and the size which it might have reached in the 24 years, if the death-rate had been 20 per 1,000 through the whole period. Twenty per 1,000 is a higher death-rate than during the year 1881; it will not, therefore, be going into the region of improbability if we suppose the average annual death-rate for the 23 years to be 20 per 1,000. The actual average has been 23 per 1,000, and the result of the calculation is that there would have been a saving of about 7,200 lives, or 300 each year.

Now that we have considered the death-rate, and seen that it has been decreasing during the last 12 years, it will be opportune to glance at the changes that have gone on during this time. They are not numerous, but they are important. First of all—in 1865, vaccination was made compulsory in Scotland. This did not prevent an Epidemic of Smallpox in 1872. It could scarcely be expected to do so. The act was not of a retrospective character, and hence the oldest vaccinated under this act could only have been seven years of age. A large number above this age had probably never been vaccinated. Besides, vaccination in childhood is, as I have said before, no sure safeguard through life against Smallpox. In 1866, a better, purer, and more plentiful supply of water was obtained. Some time after this there was a notable decline in the death-rate, which has turned out to be, not of a temporary kind, but permanent.

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In 1867 came the amended Public Health Act of Scotland, which gave additional powers to the Local Sanitary Authorities to deal with matters affecting the Public Health. The visitation of Cholera in 1866 had hastened legislation in this direction.

From 1867 to 1870 a larger and more thorough system of drainage was adopted.

Unfortunately, in the scheme, the agricultural and commercial points of view were only taken into consideration. The sanitary one was lost sight of. One of the first principles of sanitary science is to get the sewage away from the houses and town as soon as possible. After that, the agricultural and commercial interests may come into play. Sewers are not laid in order to fertilise farms, but in order to take away the sewage and drainage from the habitations, where, by its presence and accumulation, it injures health. In the laying of the sewers of Aberdeen this was not sufficiently thought of. It might have been, and probably was the main reason to begin the work, but when once commenced, there loomed in the distance an ideal sewage farm some miles away. It engrossed the attention, and everything—levels and all—had to subserve this idea. As a result, some of the sewers are merely large cesspools in another form. I have looked down the manholes and been puzzled to know in what direction the contents flowed. However, it was an immense improvement on the former cesspools, soaking as they did into the soil. The drainage also improved the subsoil, rendering it less damp, and coincident with this was a decline in Phthisis.

About 1873 or 1874 the sewers were ventilated.

Between the years 1875-76 the large Hospital for Infectious Diseases was built.

In 1879, the Sanitary Department of Aberdeen began to have a separate existence; before that time its work was done by the Police Superintendent, and an assistant in the Surveyor's office. The decline in the death-rate during 1879, 1880, and 1881 has been very marked. In 1879 the Milk-shops order came out, regulating the cleanliness, &c., of dairies and shops selling milk.

In 1881, the Aberdeen Corporation Act came into force, regulating the width of streets and the reporting of infectious diseases; last of all, the problem of the efficient ventilation of schools has been grappled with.

Side by side with these improvements has been a diminution of the death-rate.

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This diminution in the death-rate may, I think, fairly be attributed to the improvements in water-supply and drainage, for we find similar changes combined with other sanitary measures producing similar results in other towns.

Water-supply and disease have a very intimate connection with one another. The result of a scanty supply is uncleanliness and ill-health; of a contaminated supply, disease. The latter has been known, as in the now oft-quoted Aldersgate pump, to spread Cholera far and wide. Every year brings striking examples of its influence in producing Typhoid Fever, Diarrhœa, &c.

Plenty of good water for a town is as essential as plenty of good food. Good drainage has also had a most wonderful effect, especially on two diseases, viz.:—Typhoid Fever and Phthisis; in the one case by preventing contamination of the soil, in the other by drying the soil.

TABLE SHOWING THE RESULTS OF SANITARY WORKS.

NAME OF PLACE.	Average Mortality per 1000 before Construction of Works.	Average Mortality per 1000 since Completion of Works.	Saving of Life per cent.	Reduction of Typhoid Fever per cent.	Reduction in rate of Phthisis per cent.
BANBURY.....	23·4	20·5	12½	48	41
CARDIFF.....	33·2	22·6	32	40	17
CROYDON.....	23·7	18·6	22	63	17
DOVER.....	22·6	20·9	7	36	20
ELY.....	23·9	20·5	14	56	47
LEICESTER.....	26·4	25·2	4½	48	32
MACCLESFIELD...	29·8	23·7	20	48	31
MERTHYR.....	33·2	26·2	18	60	11
NEWPORT.....	31·8	21·6	32	36	32
RUGBY.....	19·1	18·6	2½	10	43
SALISBURY.....	27·5	21·9	20	75	49
WARWICK.....	22·7	21·0	7½	52	19
ABERDEEN.....	24·50	21·50	12	63	22

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The experiences of Continental towns give good evidence on this point. Let us compare the mortality per 100,000 inhabitants from Typhoid Fever in Munich :—

1st.—When there were no regulations for keeping the soil clean .	viz., from 1854 to 1859	the death-rate was			24·2
2nd.—When reforms were begun by cementing the sides and bottoms of the Porous Ashpits	from 1860 to 1865	"	"	"	16·8
3rd.—When there was partial Sewerage .	from 1866 to 1873	"	"	"	13·3
4th.—When the Sewerage was complete . .	from 1876 to 1880	"	"	"	8·7

Many other Towns could be quoted showing a like result.

Sanitary improvements, however, are not confined to drainage and water supply.

By the working of the Public Health Act, chiefly in England, overcrowding, with its attendant evil, Typhus Fever, has been greatly reduced, and the general effect of Sanitary measures over the whole of England has been a diminished death-rate. This is clearly shown by comparing the death-rate during the 4 decennial periods from 1841 to 1880 :—

ENGLAND AND WALES.

Annual Death-rate per 1000	1841-1850	1851-1860	1861-1870	1871-1880
All Causes.....	22·4	22·2	22·5	21·5
Seven Zymotics.....	—	4·11	4·14	3·36
Fever.....	—	0·91	0·88	0·49

The Medical Officer of the Local Government Board, who reports on this table, says :—"From the above figures it will be seen that, speaking generally, the death-rate of the country remained stationary from 1840 to 1870, but that in the period 1871-1880 it fell from 22·5 (of the previous decade) to 21·5, a reduction equivalent to nearly 4½ per cent. It may, therefore, be roughly estimated that about a quarter of a million of persons were saved from death in the ten years, 1871-1880, who would have died if the death-rate had been the same as in the previous thirty years. If twelve cases of serious but non-fatal illness be reckoned for every death, it follows that about 3,000,000 persons, or over one-ninth of the whole population, have been saved from a sick

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bed by some influences at work in the past decade, which had not been in operation previously. The case indeed is still stronger than this. The death-rate of rural districts is habitually lower than that of urban districts; and as the population is steadily concentrating itself, more and more into the towns, the death-rate of the whole country would tend to increase if the other circumstances affecting it remained the same. When we find that this tendency has been so much more than merely counteracted, it becomes interesting to see where the gain has been, and to endeavour to trace some of the causes to which it may be due.

"Comparing then 1861-70 with 1871-1880, it will be seen from the foregoing figures that of the entire reduction of 1·0 in the death-rate, more than three-quarters (4·14 – 3·36 = 0·78) comes under the head of the "Seven Zymotic diseases;" of the diseases, that is, which are most influenced by sanitary improvements. And of this three-quarters, just half (0·88 – 0·49 = 0·39) or three-eighths of the entire reduction, is in Fever—the disease which, more than any other, shows itself in connection with such faults of drainage, of water supply, and of filth accumulation, as it is within the province of good sanitary administration to remove.

"It is particularly significant that, since the year 1870, when the Fever death-rate was 0·80 per 1000, it has fallen pretty steadily, year by year, as follows, down to 0·32 in 1880:—

1871	·70	1876	·44
1872	·61	1877	·41
1873	·58	1878	·42
1874	·59	1879	·30
1875	·55	1880	·32

"Thus in the five years 1871-5 the Fever death-rate was 0·61; in the five years 1876-80 it was 0·38."

We may now consider what lessons are to be gleaned from the foregoing. The first and most important one is that Epidemics do not come suddenly, but always give a distinct warning. It is this signal of danger that should be heeded. There are a few deaths, then a little later on there are more deaths—and these increase more and more—and it is some time after the commencement of the Epidemic before the crisis is reached. Whatever may have been the cause of the first few, it is certain that the bulk of them are caused by coming in contact with the sick.

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Every sick person is a centre, and is as dangerous to those near him as a fire is to the buildings near it—more than this, they are moving fires. One relative comes to see another who is ill, and becoming affected carries the disease home to another part of the town, forming new centres. These centres widening their area, ultimately join, and then the crisis comes, and fortunate are those who escape scathless.

Isolation for the first cases is the remedy. Put the patients by themselves, where they can neither infect relatives nor friends, and the Epidemic will gradually die a natural death, having done little harm. When there is not sufficient accommodation at home for strict separation, these first cases, whether in a tenement house, or on a flat with few rooms, should be taken to the Hospital. An Epidemic Hospital is *not* for the accommodation and *treatment* of patients during an Epidemic. If that were so, it would require a very large one to accommodate and treat those that were sick; but the Hospital is to help to *prevent Epidemics*. It should be always open, and ready to receive the first cases occurring of an infectious kind. It is like having the fire-engine always ready to stamp out the first signs of fire. It would appear ridiculous not to use the fire-engine until it was a big fire, and beyond control.

Cunnigarhill received a misleading name when it was called the Small-pox Hospital; the name created a prejudice against it, and led people to think it was intended solely for that disease. This Hospital, with its four distinct buildings, should be open for any infectious disease. The buildings being almost as far apart as one side of Union Street is from the other, it is practically impossible for a person brought in with one disease to become infected with another. The buildings have no communication; each is self-contained, and has different nurses. The removal to the Hospital is beneficial in two ways. There is a certainty of proper isolation, so that all danger of infecting others is avoided; and there is at once a marked improvement in the patient when taken away from the stuffy atmosphere of a moderately sized house, much more so of a tenement house. The purer air is a medicine in itself—the type of disease seems to change to a milder one, and severe symptoms are rare.

The second lesson is, that the diseases that are most dreaded are the least fatal; those that have been considered simple and innocent complaints are the most fatal. If this were better known there would no doubt be greater care.

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Sanitary improvements have to do with the reduction of the total death-rate. These improvements have been enumerated. After a good water supply and proper drainage, the spreading out of the town is a most important factor in the reduction of the death-rate. The desire of every one, who can afford it, to live in the suburbs, rather than than in the centre of the town, helps materially to increase the health of the inhabitants. In the suburbs there is plenty of breathing space; human beings are not crowded together. So far, so good—yet there should be no false feelings of security—there are still places in Aberdeen quite able to nurture and spread all over the town the various Epidemic diseases, if they once secure a proper footing. The elements are present—the narrow, dingy, overcrowded, and unventilated Courts in the Gallowgate and its surroundings; the low-lying lands of Pork Lane, Water Lane, and Sugarhouse Lane; the filthy lanes leading from Justice Street to Princes Street, parallel to King Street. Those between Broad Street and St. Nicholas Street, and between the Shiprow and the Quay, are places always fraught with danger.

It can scarcely be supposed that people in these Courts will ever acquire habits of cleanliness, surrounded by everything that leads in the opposite direction. What the Courts require is opening up by being pulled down altogether, or having streets put through them. An improvement of this kind is of interest to the whole community. Disease is no respector of rank, and although some of the infectious diseases—Typhus Fever for example, only haunts as a rule the crowded and dirty parts of the town, yet no one is safe even in the better class houses. One section of society is intimately connected with other sections, however far apart they may appear on the social scale, and whatever affects the one quickly affects the other. The servants have friends in the infected districts, they take the baby to see them, the charwoman and washerwoman come from the districts, and the tradesman's assistant may live there. The tailor makes the new suit in the room where his children are lying with fever. Stockings, caps, underlinen, and other articles of clothing are made in these poor houses—even the man who brings the coals may have his family lying with fever. There is a binding link between the whole community, and what one suffers the other soon feels. Infection is likely to be carried into the house in some unexpected manner, however vigilant the watch. It is to the interest of all that the dens and nests which foster these communicable diseases should be taken down.

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The death-rate might be and should be much lower. During the last three years, since a sanitary department has been formed, there has been a marked *decline*. Aberdeen has very many natural advantages, and as it has much, much may be expected of it.

The drawback is the fatalistic light in which the cause of disease is looked at. A knowledge of the effects of sanitation; that disease is external to us; that it is unnatural, and only brought on by the breaking of the laws of health—this knowledge gradually permeating through all society, as it is promising just now to do, will be the means of saving hundreds of lives.

If a man is drowning, those on the shore, appreciating his imminent danger, are eager to help him; if a house is on fire, the neighbours, knowing the danger to their own property, assist to extinguish it; and when the danger of these diseases is thoroughly understood, and, in addition, that they can be stamped out, it is not too much to suppose that all will do their best to get rid of them as quickly as possible.

Sanitary Science is not the mere looking after drains—faulty drains are only one means of rendering the air impure. Drains have come before the public of late, because all houses in towns are connected with these long cesspools; this is a consequence of large towns. In the early days of sewering, the connection was first made on a wrong principle—the house-pipes were so connected with the drains as to be merely large flues conveying air from the sewers into the houses. The ill effects of this were felt, and traps introduced. Too much reliance was placed on these, and now it is come to be understood that the house-pipes should be only indirectly connected with the drains.

Sanitary Science includes, and tries to rectify, everything that tends to make injurious, the air, food, or drink, which are the necessities of a healthy life.

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20th March, 1883.—Sheriff DOVE WILSON, *President, in the Chair.*

JOHN DUGUID MILNE, ESQ., read a Paper entitled "The Success of Free Public Libraries in Industrial Towns, and the Necessity for a Free Public Library in Aberdeen."

THE FREE LIBRARIES ACTS.

THE first Act of Parliament for the establishment of Free Public Libraries in England was passed in 1850, under the auspices of Mr. William Ewart, M.P., who had two years previously got a Parliamentary Committee to report upon the subject. A revised Act was passed for England in 1855; and a joint Act for England and Scotland in 1866. A consolidation Act for Scotland followed in 1867; and there have been several amending Acts passed for both countries since these dates—the scope of the whole being that, in any Royal burgh or in any other burgh or populous place or in any parish, on a resolution, at a meeting of ratepayers called for the purpose, being passed by a majority of votes to the effect that the Acts should be adopted—or if the like resolution be carried by means of voting papers distributed among the ratepayers—the Town Council, Commissioners, or Parochial Board, as the case may be, shall thereupon proceed to carry out such resolution, and to that end shall have power to impose an annual rate not exceeding one penny per pound on the annual value of lands and heritages, to be assessed within burghs and populous places upon occupants, and to be assessed in rural districts along with the poor rates—one-half on occupants and one-half on owners. The management of the Libraries is placed in the hands of a Committee to be chosen by the Town Council, Commissioners, or other Board imposing the assessment, one-half from among their own members and one-half to be named by them from the general body of ratepayers. It is also provided that to the Free Library may be added a Museum or Art Gallery, and the purchase of newspapers is specially authorised for the Reading-Room; it being, however, understood that the rate for all these things cannot exceed in the aggregate the limit I have mentioned of a penny per pound in all. In addition to the resources

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afforded by the penny per pound rate, it was confidently anticipated that it would be largely supplemented by the Corporations of towns, and by the public-spirited liberality of wealthy men, especially of those who might owe their fortunes or the fortunes of their families to the industries of particular towns or districts, or who—from the interest they felt in their birthplaces, or in the localities where they were educated, or where their first struggles in life were gone through or their first successes achieved—might desire to confer a lasting benefit on these localities, and to help others who might in future have in the same old places to go through the same struggles. And I need not say that the confident expectations held from the first of munificent help coming from Corporations and wealthy men have been far more than justified.

FREE LIBRARIES IN ENGLISH INDUSTRIAL TOWNS.

Immediately on the first Library Act being passed it was adopted by various manufacturing and other industrial towns of importance, an example which has since been followed by other towns with ever accelerating speed, and to such an extent that a Free Public Library for populous industrial towns has really become a national institution. That this has been accomplished in literal truth is a very notable fact; and yet I do not think it is a very well known one in Scotland, or at least among us in this part of Scotland. This then is my first point, viz.:—The great extent to which the Free Library system has already been adopted by populous industrial towns. Leaving London out of account, there are 63 great towns in England and Wales—and by great towns I here mean towns having a population over 40,000—and these 63 great towns together have an aggregate population of 6,483,874—giving, on an average, about 100,000 to each. Now, of these 63 great towns, no fewer than 45 have already adopted the Free Libraries Acts, leaving only 18 which have not adopted the Acts. More than two-thirds, therefore, in number of the great towns have adopted the Acts; and the proportion is even larger if the relative population of these towns is regarded; for the 45 towns contain more than 5 millions of inhabitants, whereas the 18 contain less than 1½ millions, so that ten-thirteenths of the large town populations of England have voluntarily taxed themselves for Free Libraries, while only three-thirteenths have as yet abstained from doing so. Clearly, therefore, the Free Library system is popular among the masses of the people;

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and, as masses of town population are usually composed of working people, the figures I have given already indicate that Free Libraries are prized not solely or chiefly as libraries for the rich, but as libraries for the industrial classes; and this will be abundantly confirmed as I proceed.

A COMPARISON.

For let us next go over together the list of the 45 great towns that *have* adopted the system, and ask what sort of towns they are, and especially of what class of people their populations are composed; and then let us go over together the list of the 18 great towns which have *not* adopted the system, and ask of what classes their populations are for the most part composed, and then a comparison between the two may prove instructive. Take first the 45 great towns that have adopted Free Libraries, with their aggregate population of 5 millions, and we find no fewer than 36 of these to be what I may call intensely industrial towns (such as Birmingham, Liverpool, Manchester, Blackburn, Bolton, Bradford, Halifax, Leeds, Newcastle, Nottingham, Salford, Sheffield, Wolverhampton, all intensely industrial, and so on for all the 36)—leaving, therefore, only 9 of the 45 to be assigned to any other category, these 9 comprising 6 towns of mixed character (such as our own), and 3 seaport towns. Moreover, the aggregate population of the 36 great industrial towns which have adopted the Acts is 4,400,000; of the 6 great towns of mixed population, 549,359; and of the 3 seaport great towns, over 200,000—showing, therefore, in a still more striking way, the enormous preponderance of the industrial classes in towns where Free Libraries have been adopted. Take next the 18 great towns in England (other than London) that have *not* adopted the Act, and we find among them only 6 industrial towns, with an aggregate population of about 400,000, and one town like our own (York) containing a mixed population, the remaining 11 being composed of 6 residential towns (Bath, Cheltenham, Brighton, Croydon, Hastings, and Tottenham), and 5 seaport towns (Hull, Yarmouth, Portsmouth, Southampton, and Hartlepool).

RESULTS OF THE COMPARISON.

Compare now the two lists, and we have these results, viz. :—

(1.) The Free Libraries Acts have not been adopted in any residential town—that is to say, these Acts are not specially for the

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wealthy, else we should have been sure to find them in such towns as the 6 I have named as belonging to this class.

(2.) The Acts have been adopted by only 3 out of 8 of the great seaport towns, reading being apparently not much in demand by seafaring populations. That also is what one would expect.

(3.) Of 7 great mixed towns in England, such as our own, 6 have adopted the Acts, and only 1 (York) has not; and, indeed, I am not sure but I ought to have classed York among towns of a preponderatingly residential character, not one of which, as we have seen, has adopted the Acts, being composed, as they are, mostly of well-to-do people, not specially dependent on Free Libraries; and if I had classed York in this way, then all the great English towns which I have classed as mixed (like our own) would be in the list of those that *have* adopted the Acts.

(4.) Lastly, of the 43 great industrial towns, 36, with an aggregate population of about 4,400,000, have adopted the Acts, and only 6, with an aggregate population of 400,000, have not as yet done so. In other words, five-sixths in numbers of the great industrial towns of England (each having over 40,000 of a population) have adopted the Acts; or, reckoned according to population, as high a proportion as nine-tenths of the populations of the great industrial towns have voluntarily taxed themselves for the sake of getting the use of Free Libraries.

No figures could, I think, more completely demonstrate that the system of Free Libraries is an institution in the highest degree acceptable to the working classes of England. It is not specially meant for the wealthy classes, for not one of the wealthy residential towns has taken a step to establish such a thing. On the other hand, among the great industrial towns of England, as well as in the great towns of mixed population, such as ours, the adoption of the Acts is the rule, not the exception.

ENGLISH INDUSTRIAL TOWNS WITHOUT FREE LIBRARIES.

Indeed, if we examine closely the list of the 7 great industrial towns of England which alone out of the 43 have not adopted the Act, we shall be even more impressed with the sense that to all intents and purposes the adoption of the Acts in England by the great industrial towns and towns of mixed population has been substantially universal.

For of these 6 industrial towns which occur in this exceptional

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list, 4 are comparatively small, having each only 50,000 inhabitants, and one of these is of recent and mushroom growth, so that all the 4 may really be left out of account without damaging our conclusions; and, therefore, but 2 large industrial towns (viz., Huddersfield and Oldham*), each of about 100,000 inhabitants, stand out as the only exceptions of importance to the otherwise universal rule that large industrial towns in England have already adopted the Free Libraries Acts. That this pair of considerable manufacturing towns, of all others, should alone stand out in this way is the more remarkable that they belong to the circle of manufacturing towns in Yorkshire and adjoining counties that took the lead in the great struggle half a century ago for popular enlightenment by the establishment of Mechanics' Institutions; and I cannot help thinking it as possible they must have been priding themselves too highly on what they then accomplished in that direction, just as we Aberdonians have hitherto prided ourselves on what we have done for popular enlightenment through our Mechanics' Institution; and that the explanation of the indifference hitherto shown, both by them and by ourselves, to the far superior advantages of a Free Public Library, may just be that the old prepossessions are too strong for us both, and that we, perhaps unconsciously, had come to think that, having, at so great pains, got together a good Mechanics' Institution Library, there was nothing excelsior left for us to do. Be that, however, as it may, the exceptional position of these two considerable towns cannot seriously interfere with the only conclusion that can be drawn from the facts put before you to-night, viz.:—that as a whole, the great manufacturing and industrial towns of England have eagerly adopted the Free Libraries Acts, and that the Free Library has already become a national institution for all, and especially for the working classes.

SMALLER TOWNS IN ENGLAND.

Hitherto I have spoken only of the 63 largest provincial towns of England and Wales, and I may here complete our view of the breadth of the Free Library system by mentioning that the smaller towns and populous places in England have also availed themselves of it freely. There are 22 towns in England having a population ranging between 30,000 and 40,000 inhabitants, and of these just one-half have gone in for the Acts. Moreover, no less than 38 towns

* I have since learned that a Free Reference Library is to be opened in this town, on 1st August next, in connection with a Fine Art and Industrial Exhibition (see Monthly Notes of Library Association, vol. IV., page 50).

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and places under 30,000 in population have done the same—making a total of 92 towns or places in England and Wales that have taxed themselves for a Free Library.

SCOTLAND AND FREE LIBRARIES.

As to Scotland, only 8 towns have as yet adopted the Acts, viz.: —Dundee, Paisley, Hawick, Airdrie, Galashiels, Forfar, Inverness, and Thurso. Of these, Forfar, Inverness, and Thurso may be described as having a mixed population like our own, the other 5 being intensely industrial; and all further illustrate what I have said before, viz.:—That the Free Library is in Scotland, as in England, a library for all, but especially for the working man.

I may just add that the total population of towns in Great Britain which have adopted the Act is as follows, viz.:—

45 large towns in England, ...		5,020,321
11 towns (30,000 to 40,000), . . .		394,776
38 small do., ...		658,630
8 towns in Scotland, ...		271,881
102 Towns.	In all, .	6,345,608

But other towns may have adopted the Acts without their names having got into my lists, and some also have had Free Libraries gifted to them—such as Brighton in England and Dunfermline in Scotland.

THE WORKING AND POPULARITY OF THE SYSTEM.

So much for the extent to which the Libraries Acts have been adopted by industrial towns and populous places—verging almost as it does to universality. But it is one thing to have well-furnished Libraries, and quite another thing to get people, and especially working people, to use them. I shall now therefore lay before you some points to illustrate the working of the system, and the measure in which it has accomplished its objects—in a word, its popularity and usefulness—and in this branch of my subject I expect to offer conclusions equally convincing and satisfactory. And in the first place I shall give an excerpt or two from Mr. Mullens' useful handbook about Free Libraries. "How are these institutions worked, and how are they used? (he asks). First, the newsrooms. These

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are essential. They are the first step in the ladder. With the mass of men the practice of reading commences with the newspapers and periodical. . . . . The one room now before me (Birmingham) is used by more than 2000 men daily. . . . . The charm of this place is its absolute freedom. While it is used most largely by the poorer classes, yet many of the prosperous are there as well. There is perfect equality, no favour, and no jealousy, and though used chiefly by the comparatively uneducated the order and quietness of the place cannot be surpassed. The room is handsome, lofty, and well furnished. It is remarked that the men in corduroy are treated as gentlemen, and they behave as such. It is quite possible that a barn in a back slum would not be so successful. If gin palaces are brilliant and handsome, why should the opposition be enamoured of the dingy and the mean? Provide your free newsroom in a good thoroughfare; let it be its own invitation; keep it open till ten at night, and it will do more to close objectionable places and break down vicious habits than any number of police. In the same newsroom we have been describing is carried on a lending library, from ten in the morning till nine at night; and in the lending libraries it is not necessary to have expensive books. These should be kept in the reference library—so called because the books in it may not be taken away, but must be used on the premises. To many persons a quiet place to read in is now more difficult to get than books to read. It seems impossible," continues Mr. Mullens, "to visit these places and see how they are used, without expressing surprise at their success and at the enthusiasm in their favour. Booksellers who feared that they would injure their trade, find that they create a taste for reading and multiply their customers. Subscription libraries find that the Free Libraries, so far from injuring them, serve as pioneers for them. Persons begin to read when they can get books for nothing; the taste once created, they willingly pay for its gratification." A gentleman writes me as follows:—

"A sober and industrious working man complained to me of the want in Aberdeen for workmen of such a place of resort as a Free Library like as they are accustomed to in the south. He said there is always this difficulty—where can you tell a working man to go to spend his evenings, save his money, and shun the tavern? One cannot recommend cheap amusements or cheap houses of refreshment, even though on temperance principles, to a man with

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domestic ties, because all these mean money out of his scanty wages, and but little or no permanent benefit; whereas there is no entertainment equal to the entertainment we have from reading, and none so profitable or so cheap. Any one who has entered the Free Libraries of other towns cannot fail to be impressed with the strong force for good at work on the minds of the working men seen there. Some seated comfortably at the tables enjoying a book or a magazine, others at the counter waiting to exchange books for home reading; the atmosphere pure, the room bright and orderly, and the faces of the men full of quiet content, form a picture to make the heart of philanthropists glow, and even the most indifferent admire."

I may add that in the larger towns a system has of late years been added of shooting out branch Libraries for the different districts, as many as four, five, or six in number, and in connection with the reading-rooms a junior department has sometimes been provided. I mean a separate reading-room for juveniles, so that their more sedate seniors may not be disturbed by their greater restlessness or vivacity.

The interesting excerpts from Mr. Mullens' little book give you quite a bird's-eye view of the Free Library and its ongoings; and I now turn to the elaborate mass of statistics about Free Libraries in the United Kingdom, which, with great labour and perseverance, have recently been collected and tabulated by our friend, Mr. Sinclair, manager of the Aberdeen Mechanics' Institution; which statistics, I am bound to say, are quite as eloquent as Mr. Mullens' sympathetic picture, and show that that picture is not merely imaginative, but the simple truth. Mr. Sinclair's tables contain particulars of every Free Library in the kingdom, established under the Acts of Parliament; and of Free Libraries established, in several towns, by Corporations and private persons, some of which, though not under the Acts, are yet on a scale of similar amplitude. And, for the sake of comparison, Mr. Sinclair has also tabulated, in corresponding columns, the particulars about the libraries of the Mechanics' Institutions or other scientific institutions in the few towns that have not yet adopted the Free Libraries Acts; so that we have it in our power, without much trouble, to estimate the one in the light of the other. To-night I shall restrict myself to two of Mr. Sinclair's tables. The first of these is his Table II., giving results for twelve provincial towns,

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having each over 100,000 of population, and each of which has already adopted the Free Libraries Acts. These are Birmingham, Bolton, Bradford, Bristol, Dundee, Leicester, Liverpool, Manchester, Newcastle-on-Tyne, Salford, and Sheffield. These 12 towns contain an aggregate population of close on three millions, and give therefore about a quarter million population to each; and Mr. Sinclair's information is as follows, viz.:—The number of volumes in the lending libraries of *each* of these twelve towns is on an average 40,000 volumes, and the number of volumes in each of their reference libraries is 30,000 volumes, giving a total average number of volumes in both branches of *each* Library of 70,000 volumes. Here then is shown, in the first place, that in these Free Libraries (besides a liberal supply of newspapers in the reading-rooms), there is a magnificent library of books at command—from the larger half of which the poorest may borrow free of charge for himself and his family to read at home, there remaining a lesser though more costly and valuable half from which he may draw at his choice and spend his time over in the reading-room, besides of poring over the newspapers and periodicals. The next particular of importance is the number of different persons who in any one year take out books from the lending section of the Libraries in each of these 12 towns, and that number I find on an average for each of the 12 towns is 12,000 odds, as compared with an average population in each town in men, women, and children, of about 250,000—giving therefore 54½ readers for every 1000 of population. Moreover, I find that each of these readers takes home with him to be read by himself and his family about 30 volumes in the year, and I also find that out of 300,000 volumes so taken home the number estimated as likely to get lost is only about 20 in the year. No separate record is kept of the number of different persons who consult the reference libraries, or of those who merely frequent the reading-rooms. But the issues of books from the reference libraries, as compared with the issues from the lending libraries, are found to be as 5 to 9; and, in addition, there are of course many readers of newspapers and periodicals only, who do not trouble themselves with books either from the reference or from the lending libraries. Altogether, therefore, at a guess, we may put the entire number of readers in the three sections of Free Libraries at about 100 in the 1000 of the population, or 1 in every 10 of the population (men, women, and children). In the six Scotch towns that have already

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adopted the Acts the number of readers of the lending section of the Libraries alone to every 1000 of population is 61, which is considerably higher than in England; and the total number of readers who benefit from the lending and reference libraries and news-rooms cannot be put at less than 1 in 10 of the population (men, women, and children), as I have already estimated for the English industrial towns. This is a large proportion, especially as there has to be added to it those members of the reader's family who, along with himself, may read the 30 volumes a-year on an average which he brings home with him for domestic perusal. Moreover, in these estimates I am only speaking of averages, and these, of course, may be exceeded to any extent in towns wherein a taste for reading gets developed. For example, at Birkenhead, Bolton, Derby, Doncaster, Galashiels, Manchester, Newcastle, Shields, Southport, and Worcester—all for the most part intensely industrial towns—the readers from the lending libraries *alone* number about 1 in 10 of the population; while at Hawick and Richmond the proportion reaches nearly 1 in 5. From all this it is evident that Free Libraries are thoroughly appreciated by the industrial classes, and have entirely met the purposes for which they were devised.

A CONTRAST.

As a contrast to these remarkable results, what do we find about the comparative popularity or success of Mechanics' Institution Libraries? And, first, the number of considerable towns that yet stand only by their Mechanics' Institution Libraries is so small that we can hardly muster up a sufficient number with which to make the comparison. But I have picked out five from Mr. Sinclair's list, each of about 90,000 of population, viz., York, Huddersfield, Oldham, Hull, and Burnley—each of which has a Mechanics' Institution Library of about 7000 volumes—and has as readers about 9 in every 1000 of population. In other words, the supply of books in Free Libraries in proportion to the population of the locality is about fourfold the supply usually provided by Mechanics' Institutes; and, on the other hand, the number of readers of the Free Library in proportion to the local population is about tenfold the number of readers in the Mechanics' Institute—with this further notable distinction, that the 9 readers out of 10 who are wanting to the Mechanics' Institute, but are present in

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the Free Library, will be found to be for the most part the working men, the men of the industrial classes proper; the very men, therefore, for whom these institutions were both alike chiefly designed; but with so very striking a difference in point of success.

LONDON, EDINBURGH, AND GLASGOW.

I have already noticed Huddersfield and Oldham* as the only two important provincial towns of England of an industrial character which have not already adopted the Libraries Acts. I have as yet, however, expressly omitted from my lists the great city of London itself, the metropolis of the kingdom; which also has not adopted the Acts, and along with the national metropolis I may now speak also of our Scotch metropolis, Edinburgh, and our manufacturing metropolis, Glasgow, of both of which the same must be said. Why is it that these great leading towns have shown apparent indifference in this matter, in contrast with the eagerness to take the fullest possible advantage of the Acts which has been shown by the crowded, industrial populations of the provinces? I feel that I am unable fully to explain the anomaly; but I may mention one or two considerations which may have some bearing on it. 1. The statistics I have submitted to-night show that the great residential towns of the provinces, preponderately occupied by the wealthy and well-to-do, exhibit the same indifference. Free Libraries are not specially for the wealthy or for the residential towns of the wealthy, and this principle is no doubt in a great measure operative in retarding the movement for Free Libraries in such towns as London and Edinburgh, and even to some extent also in Glasgow. 2. It has been pointed out that in London there is a large class of householders who take leases of houses at the enormous rents for which alone houses can be got in London, and themselves merely occupy a basement room or two, while they make their living by letting furnished apartments, and that the people of this class for obvious reasons are very clamorous in their opposition to the adoption of the Acts, and the same class must be pretty numerous both in Edinburgh and in Glasgow. 3. The Local Government in the several districts of such a huge city as London is weak and uninfluential, and it seems impossible to carry out any important improvement in the face of factious opposition on the part even of a small minority.

* But see Note antea, page 7.

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4. There are already magnificent Free Libraries and Museums in London open to all, as those of the British Museum and South Kensington. Moreover, the Corporation of London has a Free Reference Library of some 80,000 volumes. Edinburgh, again, is full of great libraries, most of which are accessible for consultation; and Glasgow has also many great Free Libraries, including the Stirling Library of 50,000 volumes, and the Mitchell Library of 40,000 volumes (both being reference libraries). And the existence of these splendid libraries in the towns named may give rise to the feeling that they are already sufficiently equipped in that way. In fact, these towns want the stimulus which might have impelled them to use the Free Libraries Acts had there been a total want of library accommodation. But whatever force there may be in these considerations, I feel they fall short of an adequate explanation; and that much is attributable to public attention not having been sufficiently called to the subject, just as hitherto our own attention has not been called to it as affecting our own city. Fortunately this is a fault that admits of amendment. For great as the advantages may be of having such splendid reference libraries as I have referred to, in London, Edinburgh, and Glasgow, they do not, so far as I can understand, administer to the wants and tastes of the working man and of the industrial population generally as have the Free Libraries established under the Acts, which have proved so beneficial and acceptable. And there still appears to be quite as much need for Free Libraries for the industrial classes in London, Edinburgh, and Glasgow, as anywhere else.

NECESSITY FOR A FREE LIBRARY IN ABERDEEN.

I now come to our own town, Aberdeen, which had a population in 1881 of 105,003. Aberdeen has not yet adopted the Free Libraries Act. It has hardly even been seriously suggested to us that it should do so. In a word, Aberdeen is one of the great towns that have stood by their Mechanics' Institutions. And a good and useful organisation no doubt our Mechanics' Institution has been in every section of its work. Its library especially has been one of the best in the list of Mechanics' Institutions, and still continues to be of the first class, containing 16,000 volumes, which is very much above the average of similar institutions. But of course it is not a Free Library, and there has always been a small charge made to subscribers, ranging from 5s. to 10s. 6d. a-year, and

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experience has demonstrated that a subscription library is a very different thing indeed from a Free Library—so far, at least, as the industrial classes are concerned. Accordingly, although one year with another the number of readers of our Mechanics' Library is not less, and has on the whole been even larger than the number of readers in other Mechanics' Institutions, such as Edinburgh, the number is still small, being at present some 800—or about 8 in the 1000 of population—while, I am sorry to say, the working man is conspicuous in the list of readers by his absence, or at all events his rarity. Now, as showing by way of contrast the potency of a mere touch of the new power that lies in a Free Library, look at the recent gift by Sir John Anderson of a Free Library to Woodside, an industrial suburb of our own town, which, counting in some neighbouring villages, has a population of some 5000 odd, composed almost wholly of factory hands, and you will be astonished to find that the Free Library in that small place has already a much larger number of readers than the library of the Aberdeen Mechanics' Institution—indeed, about double the number. "Let me explain," writes Mr. Duthie, the librarian of the Woodside Library, "that our Library was opened on the 17th August, 1881, and closed on the 27th June, 1882, till a more suitable building could be erected for it. It was opened at first one night each week for two hours; but the crowd became so great that within three weeks we could not supply the demand, and had to open two nights each week. We could not supply the demand for readers' tickets, so that for a month at first the number of books given out was less than otherwise it would have been. Night after night the people stood on the narrow stair of the school packed as close as they could stand, as, owing to our limited accommodation, not more than two could be supplied at one time with books. Most had to stand thus for an hour, and sometimes longer. I am quite sure Sir John will be grateful if his generous self-sacrifice leads in any way to the promotion of an end so desirable as the adoption of the Free Libraries Act in Aberdeen." Perhaps you will say that this *furore* to become readers of Sir John Anderson's Library may have arisen from its novelty—and no doubt that is partly true—but it is not the whole truth by any means, for I have shown that in some other towns the proportion of readers is nearly as large (1 in 5), and that in many other industrial towns which have had their Free Libraries for many years, the habitual readers from their lending departments alone

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count as high as 1 in 10 of the population. It is not the novelty, even chiefly, that is the charm, it is the perfect freedom of the whole system, which puts the best of the world's good things in knowledge, sentiment, entertainment, and amusement, at the command of every man or woman who has derived any benefit from our colossal system of national education, of which the Free Library is but a natural continuation and complement.

And now—Ought Aberdeen to adopt the Free Libraries Acts? My answer is—I think it ought. Aberdeen has a large industrial population, and also a large mixed population, and it is just the towns of industrial and mixed populations that have so largely adopted and benefited from these Acts in England. Indeed, I venture to say that, if the information about the successful operation of Free Libraries in the great industrial towns in the south, which I have had in my power to bring under your notice to-night, had been sooner known to us, we should have adopted the Acts long ere now. I confess that that information (which was only recently communicated to me by Mr. Sinclair's tables), has made a profound impression on myself. Many years ago I took an active share in the working of the Mechanics' Institution here, and I and my colleagues helped to enlarge its scope and success as best we could, and I recollect we were pleased, on the whole, with what we thought was success. In the library we took a special interest, and it is really at this moment, as I have said, among the best libraries in any of the Mechanics' Institutions. But throughout the history of Mechanics' Institutions the disappointment—the skeleton in the house—has always been that we could get every sort of person to read in our libraries except mechanics themselves. We reduced our scale of charge to 1s. a-quarter to tempt them, but in vain. We then said to ourselves, with virtuous indignation, that men who could grudge a penny a-week to read from a library that had given us so much trouble to nurse were beyond coaxing, and would not come near us though we were to let them do it for nothing; and having come to this sage conclusion, some of us, I among the number, put aside the further solution of the problem as, for the time at least, impossible. Gentlemen, we were wrong. It was and is one thing to offer to a workman *free* access to a Library and Reading-Room—with comfort within and brilliancy without—open throughout the day, seasoned with bright and gossipy newspapers, illustrated weeklies, and grave magazines,

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and all freer than the air he breathes; and it is or was quite another thing to offer to a workman for 1s. or 1s. 6d. a-quarter the choice from a third-floor apartment, which certainly had no brilliancy about it, of a volume at a time, from a certain section of a somewhat faded collection of books. That the library was and is truly a good one, was and is indisputable, but that there was nothing about it to attract the passing workman was only too well proved by his persistently passing it unheeded. To this we bowed as to a necessity. It has been proved by the experience of the Free Public Libraries that we were wrong. The time, therefore, I think, has come when the people of Aberdeen, including the workmen of Aberdeen, ought to reconsider their position in this matter. My own conclusions are nothing unless the information which has led me to them make a like impression on others. My object has been to put that information before you in a shape to carry its meaning with it as that meaning has impressed itself on me. The time also is opportune in that at the present moment there is a shaking of the dry bones of our institutions in Aberdeen, and the awaking of a spirit that will soon draw these bones together again with new flesh upon them and a new life.

WHO SHOULD MOVE FOR A FREE LIBRARY?

A word, in conclusion, on the question on whom it lies to move for a Free Library in Aberdeen; and to this I answer without hesitation, the working classes, the industrial classes themselves, if really they want to have such a thing. The Free Library is not especially for the wealthy, nor even for the well-to-do, but for the people, for the industrial classes; and it is for the industrial classes themselves to say if they want it. They have also the power in their hands, as they form a majority of the ratepayers. For nine-tenths of the whole dwelling-houses within the municipal boundary are rented under £20; and three-fourths of the whole dwelling-houses within that boundary are rented between £5 and £8. If, therefore, they, the industrial classes, make up their minds to have this thing, no one can gainsay them. They also know the cost it will be to them, viz., 6d. a-year if their rent is £6 a-year, and so on, up or down. I have described what a Free Library and Reading-Room is, and it is just for the working man to judge if it would be worth his 6d. a-year to go in for it. Moreover, I should say that even though the working classes had not the power in their own hand (which they really

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have), yet were they to come forward in anything like a marked way to make known that they really do want such a thing as a Free Library, I don't believe there is any class among us who would try to thwart them in getting here what all their brethren in the south already enjoy. I may further say that if the Act should be adopted, the directors of the Mechanics' Institution are prepared to hand over to the Free Library their whole stock of books as a nucleus of that new establishment, and not only so, but to hand over also their handsome buildings in Market Street, the large and centrical hall of which could at once be turned into a public Reading-Room; or, if it were thought preferable to erect a new Library and Reading-Hall in any other part of the town, these premises in Market Street might be sold and the proceeds made available towards the erection of new premises. But these are matters of detail which may be left to settle themselves as they best may. With the people, with the industrial classes, the question is, whether they are to make up their minds to have a Free Library and Reading-Room or not.

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ABERDEEN PHILOSOPHICAL SOCIETY.

INSTITUTED, JANUARY, 1840.

CONSTITUTION AND RULES.

I.—The object of the Society shall be—to receive, at its stated Meetings, Original Papers and other Communications contributed by its Members, on subjects of Science, Literature, and Philosophy.

II.—The Society to meet at least once a-month during the Winter Session of the University; intermediate Meetings if business arise.

III.—The Office-Bearers to consist of a President, two Vice-Presidents, Treasurer, and Secretary, and three other Members. These shall form the Council of the Society.

IV.—Candidates for admission as Ordinary Members to be proposed and seconded at any Meeting of the Society, and the vote on their admission to take place at a subsequent Meeting—notice thereof to be given by the Secretary, and one vote in three, if adverse, to be a vote of non-admission. Honorary Members to be admitted according to the same rule, but Ordinary Members becoming non-resident may be transferred, at their option, to the list of Corresponding Members without ballot.

V.—Professors and Lecturers of the University to be admitted as Ordinary Members without ballot, on being nominated in the usual manner.

VI.—Ordinary Members to pay, on their admission, £1 1s. of Entry Money, besides such Annual Subscription as may be determined at the December Meeting of the Society for each session subsequent to that of their admission.

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VII.—No Motion, involving any change upon the Rules, to be put to the vote until it has been on the table for one month. The Motion to be decided by the majority of votes given by Members present—the Chairman having both an ordinary and a casting vote.

VIII.—The Secretary, three days before each Meeting, to issue Circulars to the Resident Members, intimating the place of meeting, the title of the paper to be read, and the business to be disposed of.

IX.—The Secretary to keep a Minute Book of the proceedings of the Society.

X.—The Treasurer, or Secretary and Treasurer, to lay before the December Meeting a statement of the Income and Expenditure of the Society for the previous year.

XI.—In Elections, the Chairman to have both a deliberative and a casting vote.

XII.—The Council shall assist the Secretary in procuring Papers, and shall authorize selections from the Papers read to be printed for the Members. The Council shall represent the Society in business arising when it is not in session, and shall decide as to the distribution of Copies of the Transactions beyond those to Ordinary Members.

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ABERDEEN PHILOSOPHICAL SOCIETY.

OFFICE-BEARERS, 1884.

President.

JOHN DOVE WILSON, LL.D., Sheriff-Substitute of Aberdeen and Kincardine.

Vice-Presidents.

JOHN STRUTHERS, M.D., Professor of Anatomy, Aberdeen University.
ALEX. BAIN, M.A., LL.D., Emeritus Professor of Logic, Aberdeen University.

Committee.

JOHN MILLER, Aberdeen.
ALEX. CRUICKSHANK, M.A., LL.D., Aberdeen.
Dr. ROBERT BEVERIDGE, Aberdeen.

Secretary and Treasurer.

ALEX. D. MILNE, 58 Marischal Street, Aberdeen.

Honorary Members.

Date of Admission.

1841—Rev. George Gordon, M.A., LL.D., Birnie.
1841—John S. Blackie, M.A., F.R.S.E., late Professor of Greek, University of Edinburgh.
1841—William Templeton, M.A., M.D., Aberdeen.
1843—Andrew Findlater, M.A., LL.D., late Head Master of Gordon's Hospital, Aberdeen.
1843—J. P. Walker, M.D., late of Aberdeen.
1843—Rev. John Davidson, M.A., D.D., Inverurie.
1844—Rev. Alex. Mitchell, M.A., D.D., Dunfermline.
1844—Rev. W. P. Smith, M.A., D.D., Tough.
1849—John Smith, M.A., M.D., LL.D., Professor of Chemistry and Natural Philosophy, Sydney.
1853—Immanuel Schmidt, Ph. D., Berlin.
1865—Henry Ambrose Smith, London.
1870—The Earl of Crawford and Balcarres.
1877—George Ogilvie Forbes, M.D., of Boyndlie, late Professor, Aberdeen University.

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Honorary Members—(*Continued*).

Date of Admission.

1878—The Hon. Sir Arthur H. Gordon, K.C.M.G.
1879—David Gill, LL.D., Astronomer Royal, Cape of Good Hope.
1884—Alex. Bain, M.A., LL.D., Emeritus Professor of Logic, University; Lord Rector.
1884—Francis Ogston, M.D., Emeritus Professor of Medical Logic and Medical Jurisprudence, University.
1884—William Watson, W.S., Ex-Sheriff-Substitute.
1884—Norval Clyne, M.A., Advocate.
1884—Robert Beveridge, M.A., M.B.
1884—George Grub, M.A., LL.D., Advocate, Professor of Law, University.
1884—William D. Geddes, M.A., LL.D., Professor of Greek, University.
1884—John D. Milne, M.A., Advocate.
1884—James S. Brazier, F.C.S., Professor of Chemistry, University.
1884—Rev. A. M. Fairbairn, LL.D., Principal of Airedale College.
1884—William Robertson Smith, M.A., LL.D., F.R.S.E., Professor of Arabic, Cambridge University.
1884—John Comrie Thomson, Sheriff of Ayrshire.

NOTE.—Most of the Honorary Members were originally Ordinary Members, and the dates of their first Election as such will be found in a previous part of this volume.

Ordinary Members.

1842—Alex. Cruickshank, LL.D.
1842—James Booth, M.D.
1850—Charles Duncan, Advocate, County Procurator-Fiscal.
1852—Rev. Alex. Beverley, LL.D.
1852—David McHardy, of Cranford.
1853—William Fraser, Surgeon.
1854—John Miller, Manufacturing Chemist.
1854—James Matthews, Architect.
1854—William F. Ogg, Advocate.
1854—James Augustus Sinclair, C.A., Banker.
1854—Peter Duguid, Advocate.
1855—James Walker, Wine Merchant.
1855—Alex. Simpson, Sen., Advocate.
1855—William Paul, Advocate.
1856—James Rettie, Jeweller.
1857—Alex. D. Milne, Merchant.
1858—George Cadenhead, Advocate, City Procurator-Fiscal.
1861—John Willet, C.E.
1862—George W. Wilson, Artist.
1862—Thomas Ruxton, Advocate.
1862—James Clyne, Jun., Merchant.
1863—James W. Barclay, M.P.
1863—Rev. William Milligan, D.D., Professor of Divinity, University.
1863—Robert Abernethy, C.E.

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Ordinary Members—(*Continued*).

Date of Admission.

1863—Lachlan M'Kinnon, Jun., Advocate.
1863—William Smith, City Architect.
1863—William Jopp, Wine Merchant.
1863—John Struthers, M.D., Professor of Anatomy, University.
1865—Francis L. Pirie, Manufacturer.
1866—John Ligertwood, Advocate, Sheriff-Clerk.
1867—Alex. Ogston, M.D., Professor of Surgery, University.
1867—William Milne, C.A.
1867—James W. F. Smith-Shand, M.D., Professor of Practice of Medicine, University.
1868—Alex. Yeats, Advocate, Town-Clerk Depute.
1868—Angus Fraser, M.D.
1869—Alex. Dyce Davidson, M.D., Professor of Materia Medica, University.
1870—William Yeats, Advocate.
1873—Patrick H. Chalmers, Advocate.
1873—William Alexander, Editor, *Aberdeen Free Press.*
1873—Harvey Hall, Advocate, C.A.
1874—John Dove Wilson, LL.D., Advocate, Sheriff-Substitute of Aberdeen and Kincardine.
1874—John O. Macqueen, S.S.C.
1874—Alex. Smith, Manager, Gas Works.
1874—Thomas A. W. A. Youngson, Advocate.
1875—James Paterson, Merchant.
1875—John Keith, Banker.
1875—Rev. James Wiseman, M.A., Buxburn.
1875—J. P. Cumine, Advocate.
1875—Archibald M. M'Donald, Advocate.
1875—J. Russell Mackenzie, Architect.
1876—Alex. S. Cook, Merchant.
1876—Arthur D. Morice, Advocate.
1876—Alex. M. Ogston, Manufacturer.
1876—Robert B. Horne, Sharebroker.
1876—James Duguid, Advocate.
1876—Farquharson T. Garden, Advocate.
1877—James M. Garden, Advocate.
1877—John Ligertwood, M.D., Methlic.
1877—Alex. Walker, Wine Merchant.
1877—John Morgan, Builder.
1877—James Tytler, C.A., Sharebroker.
1877—Patrick Cooper, Advocate.
1877—William Boulton, C.E., Town Surveyor.
1877—William Stephenson, M.D., Professor of Midwifery, University.
1877—Stewart D. F. Salmond, D.D., Professor of Exegetical Theology, Free Church College.
1878—George L. Rorie, Banker.

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Ordinary Members—(*Continued*).

Date of Admission.

1878—William Stirling, M.D., Professor of Institutes of Medicine, University.
1878—Major John Ross, Chief Constable of Aberdeenshire.
1878—George Miller, Manufacturing Chemist.
1879—Thomas Jamieson, F.C.S., Fordyce Lecturer, University.
1879—Alex. Copland, Merchant.
1879—David McHardy, Jun., Manufacturer.
1879—Arthur Clyne, Architect.
1879—George Jamieson, Merchant, Ex-Lord Provost.
1879—Alex. Collie, M.D., Homerton Fever Hospital, London.
1880—Alex. Ramage, Rector, Free Church Training College.
1880—David Littlejohn, Advocate.
1880—David W. Abernethy, Engineer.
1880—Peter Esslemont, Merchant, Ex-Lord Provost.
1881—Rev. Robt. Lippe, Chaplain, Royal Infirmary and Lunatic Asylum.
1881—F. Maitland Moir, M.B.
1881—Alex. Forbes, Merchant.
1881—Joseph Ogilvie, M.A., Rector, Church of Scotland Training College.
1881—John G. Hall, M.D., Assistant, University.
1881—Joseph R. Cornwall, Lithographer.
1881—William Minto, M.A., Professor of Logic, University.
1881—James M'Cormack, Superintendent of Postal Telegraphs.
1881—William Smith, Harbour Engineer.
1881—Rev. George Pirie, M.A., Professor of Mathematics, University.
1881—Alex. M. Mackenzie, Architect.
1881—Thomas Skene, Inspector of Poor.
1882—David Stewart, Manufacturer.
1882—James Forbes, Merchant.
1882—William Lindsay, Publisher.
1882—David Sinclair of Altens.
1882—Oswald Prosser, Solicitor.
1882—William J. Simpson, M.D., Medical Officer of Health.
1882—Gustav Hein, Teacher of Modern Languages.
1882—Rev. James M. Danson, M.A., St. Andrew's Episcopal Church.
1882—James Moir, M.A., Rector, Grammar School.
1882—Charles A. Mollyson, North of Scotland Bank.
1882—William C. Fyfe, Scottish Provincial Assurance Company.
1882—James P. Kay, Chemist.
1883—William H. Williamson, M.D.
1883—John Roy, Teacher.
1883—George G. Jenkins, C.E.
1883—William L. Henderson, Architect.
1883—Alex. Adam, C.E.
1883—Alex. M. Williams, M.A., Teacher.

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Ordinary Members—(*Continued*).

Date of Admission.

1883—Rev. Chas. M. Black, St. James' Episcopal Church.
1883—John Seivwright, Merchant.
1883—Robt. J. Garden, M.D.
1883—John Parker, Advocate.
1883—John William Crombie, Manufacturer.
1883—Theodore Crombie, Manufacturer.
1883—John B. Pirie, Architect.
1883—F. Grant Ogilvie, B.Sc., Teacher.
1883—David Walker, Bookseller.
1883—John C. O. Will, M.D.
1884—Colonel J. Allardyce.
1884—Ranald Macdonald, Factor for the Cluny Estates.
1884—Rev. Arthur F. S. Hill, M.A., St. Mary's Episcopal Church.
1884—Alex. Mackie, M.A., Teacher.
1884—Rev. Wm. H. Bleaden, St. John's Episcopal Church.
1884—Wm. C. Good, Manufacturer.
1884—Wm. Mackay, Chemist.
1884—James Minty, Inspector of Cleansing.
1884—Hugh F. Campbell, M.A., Teacher.
1884—Rev. George A. Smith, M.A., Queen's Cross Free Church.
1884—Alexander Kemlo, Advocate.
1884—Rev. William T. Ker.
1884—Rev. Henry W. Wright, Ferryhill Parish Church.
1884—John Findlater, Banker.
1884—Hugh Mackenzie, Teller, North of Scotland Bank.
1884—John Wight, M.D.
1884—Robert Smith, Joint Agent, Bank of Scotland.
1884—John D. Anderson, M.A., Teacher.
1884—Jas. M'Kenzie Booth, M.B.
1884—Jas. Davidson, Manager, Accident Insurance Co.
1884—Alex. Forbes, Teacher.
1884—P. J. Anderson, M.A., Teacher.

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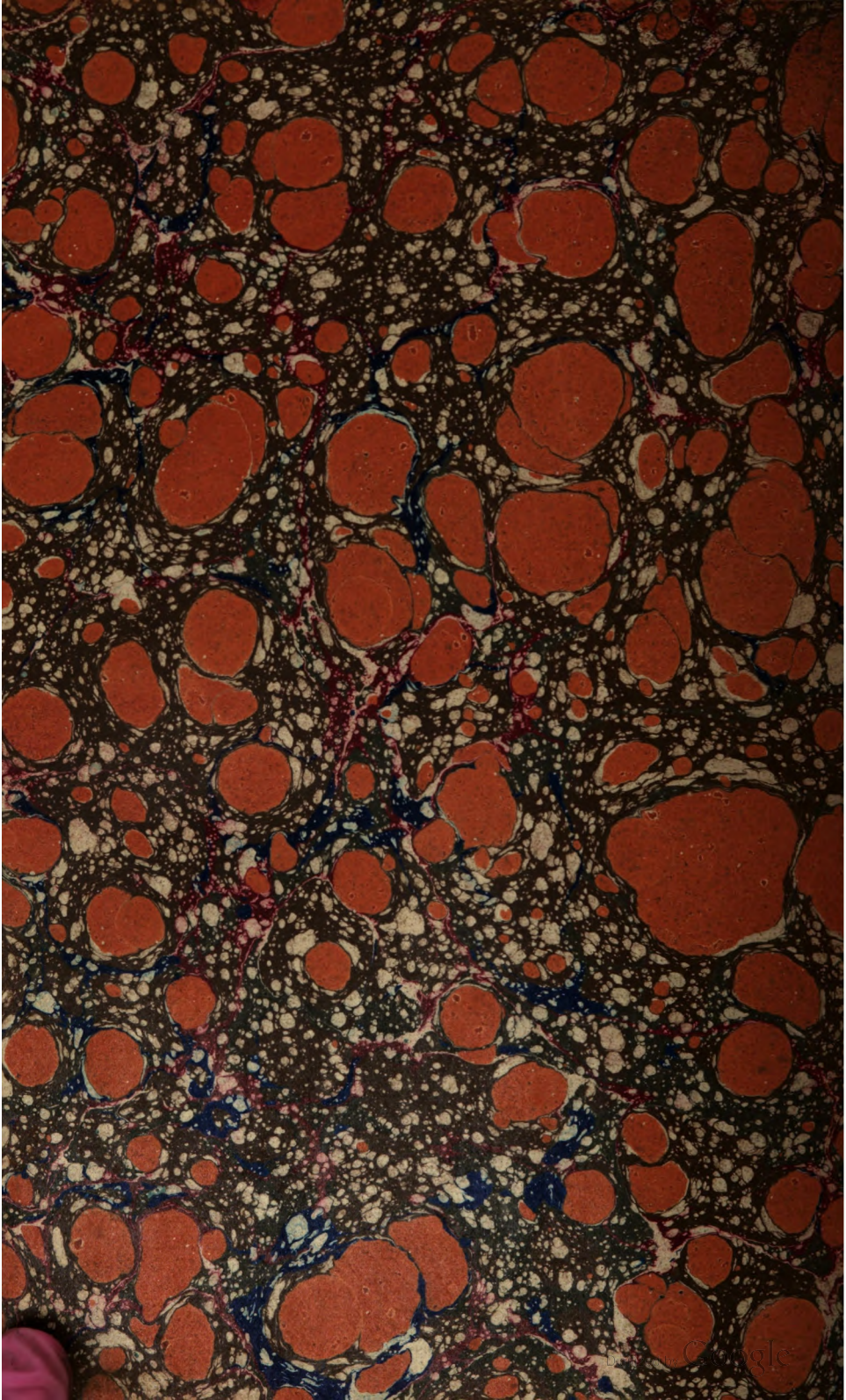

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